KNIGHT GLOBAL

Servo Hoist Operation Manual

THIS MANUAL CONTAINS IMPORTANT INFORMATION REGARDING INSTALLATION, SAFETY, MAINTENANCE, AND OPERATION OF THE KNIGHT GLOBAL SERVO HOIST AND SHOULD BE AVAILABLE TO ALL PERSONNEL. RESPONSIBLE FOR USING THE HOIST.

REV: 002-202502

This manual provides important information for all personnel involved in the installation, operation, and maintenance of the Knight Global Servo Hoist.
All personnel must read this document before operating the equipment.

Every effort has been made to provide complete and accurate product information in this manual. However, due to product improvements and changes, discrepancies and omissions may be present.
Visit our website at www.knightglobal.com for the updated information on all our products.

It is the responsibility of the end user to exercise common sense and judgment when performing the tasks described in this manual. If any procedure seems inaccurate, incomplete, or unsafe please put the equipment in a safe condition and contact Knight Global service department for assistance. Knight service department's phone number is: (248) 377-4950 x246.

Throughout this manual there are steps and procedures that if not performed correctly can result in personal injury or equipment damage. The following signal words are used to identify the level of potential hazard.

	**WARNING** **Indicates a hazard which will cause severe injury, death, or substantial equipment damage.**

	**CAUTION** **Indicates a hazard which can or will cause injury or equipment damage.**

	**NOTE** **Notifies personnel of installation, operation or maintenance information which is important but not hazard related.**

	**NOTE** Servo System Operation Manual QR Code: REV: 002-202502

1. SAFETY

Knight Global cannot be aware of or provide for all the procedures by which the Servo Hoist operations or repairs may be conducted and the hazards which may result from each method.
If operation or maintenance not specifically recommended by Knight Global is conducted, it must be ensured that product or personnel safety is not endangered by these actions. If not sure of an operation or maintenance procedure or step, personnel should place the Servo Hoist in a safe condition and contact a supervisor and/or Knight Global's service department for technical support.
Modifications to upgrade, re-rate or otherwise alter this equipment shall be authorized only by the original equipment manufacturer.

If a below-the-hook lifting device or sling is used with the Servo Hoist, refer to
ANSI/ASME B30.9 "Safety Standard for Slings", or
ANSI/ASME B30.20 "Safety Standard for Below-the-Hook Lifting Devices".

Electrical equipment described in this manual are designed and built in compliance with ANSI/NFPA 70, "National Electrical Code".
It is the responsibility of the system designer, system manufacturer, crane or rail manufacturer, installer, and user to ensure that the installation and associated wiring of the Servo Hoist and components are in compliance with ANSI/NFPA 70, and all applicable Federal, State and Local Codes.

Hazardous voltages are present in the Servo Hoist and components.
Only properly trained and competent personnel should perform inspections or repairs on the Servo Hoist or accessories.
Prior to performing any maintenance (mechanical or electrical) on the Servo Hoist, de-energize (disconnect) the main switch supplying power to the Servo Hoist.
Lock out the power supply following standard plant procedures.

Ensure that the installation, inspection, testing, maintenance, and operation are in compliance with ANSI/ASME B30.16 "Safety Standard for Overhead Hoists", OSHA Regulations, ANSI/NFPA 70, National Electric Code, and applicable ANSI/ASME standards.
This is the responsibility of the owner/operator.

All personnel that will install, operate, inspect, test, or maintain the hoist should read this manual and be familiar with all applicable portions of the referenced standards.

If clarification of any information in this manual or additional information is required, contact Knight Global. Do not install, operate, inspect, test, or maintain the hoist unless all information is understood.

A. General Safety Precautions

- Do not operate the Servo Hoist before reading this technical manual.
- Allow only personnel trained in safety and operation of this Servo Hoist to operate the Servo Hoist.
- If the Servo Hoist is locked out or a “DO NOT OPERATE” sign is on the Servo Hoist or controls, do not operate the Servo Hoist until the lock or sign is removed by designated personnel.
- Do not use the Servo Hoist if hook’s safety latch has been sprung or broken.
- Before each shift or prior to use, inspect the Servo Hoist in accordance with the procedures defined in the Maintenance section of this manual.
- Never place your hand or fingers inside the throat area of a hook.
- Never operate a Servo Hoist with twisted, kinked, or damaged chain.
- Only operate a Servo Hoist when the chain is centered over the hook. Do not “side pull” or “yard” the chain.
- Do not force the hook into place by hammering.
- Ensure the load is properly seated in the saddle of the hook.
- Never run the chain over a sharp edge.
- Always pay attention to the load when operating the Servo Hoist.
- Ensure no personnel are in the path of the load.
- Do not lift the load over personnel.
- Never use a Servo Hoist for lifting or lowering people.
- Do not allow anyone to stand on a suspended load.
- Do not swing a suspended load.
- Never leave a suspended load unattended.
- Never cut or weld a suspended load.
- Do not operate a Servo Hoist if the chain is jumping, jamming, overloading, or binding.
- Do not operate a Servo Hoist if it is generating excessive noise.
- Avoid collisions or bumping of the Servo Hoist.
- Do not operate Servo Hoist when damaged or malfunctioning.
- Do not remove load or handling device until tension is released from the chain.
- Discontinue operation of Servo Hoist after multiple unresolved faults. A system fault would be signified by the Red light on the Run-Stop button continuously flashing or the Run-Stop button having to be repeatedly reset.

B. Safety Devices

Motor Holding Brake

A motor holding braking system engages and holds the vertical axis in place in the event of a power outage or when the Run-Stop button is pressed.

Overload Capacity Protection

Protects the equipment and prevents the operator from lifting or moving more weight than the system is rated for. If the load weight exceeds the programmed capacity, the hoist will not lift any further until the excess load is removed. Downward motion is permitted when overloaded to allow the user to safely set the weight back down on a stable surface.

Run-Stop Push Button

If an operator needs to shut down the system immediately, the operator pushes the Run-Stop button. The system will not function until it is reset. To reset the system from the Run-Stop condition, the operator turns the button clockwise to release it from the depressed position. All virtual limits and programs remain intact.

Safety Drop Stop (SDS) Chain

All Standard units have a Safety Drop Stop (SDS) chain included. The SDS Chain moves up and down the vertical axis with the load chain. It provides load stabilization in the event of a catastrophic load chain failure. This unique feature has a US Patent NO. 10,099,904 awarded as of 2018.

Side cover Safety cable

All Standard units have a side cover safety strap secured from the backplate to each of the side covers. Please note, the side cover safety cables can NOT be used for anything other than their intended function. This cable can NOT be used as a trolley tow cable or a retention wire.

Chain stops

All Standard units have two chain stops that are installed at the ends of each chain: Load and Safety. These chain stops prevent the chains from being paid out too far if a parameter is set to an incorrect value.

Trolley Safety Cable

All Standard units have a trolley safety cable. This cable ensures the hoist will continue to be suspended if the supporting bolts fail.

Clevis Bolt Cotter Pin

All Standard units have a clevis bolt cotter pin. This pin ensures that bolt's nut does not unthread from the fixture's supporting bolt.

2. INSTALLATION

Prior to installation, visually inspect the Servo Hoist for signs of damage or missing parts.

CAUTION

Prior to installation, the chain must be lubed.
Knight Global recommends the use of Chain Grease.
The part number of the Chain grease tube is: 665 009 44.
If Chain grease is not available, SAE 50 to 90 EP oil or equivalent may be used.
Follow the procedure detailed in section 4.4.3 "Chain Lubrication" of this manual.

CAUTION

Prior to placing this unit into service, the owners and user are advised to examine specific local and/or other regulations, including ANSI and OSHA regulations that may apply to the use of this product.

WARNING

A falling load can cause injury or death. Before installing this hoist read the "Safety" section of this manual.

Follow all procedures in this section for installation and set-up of the Servo Hoist.

Retain all product information supplied with the Servo Hoist for future reference.

Ensure that the supporting structure can support the weight of the system and load. The structure should be able to support 300 percent of the combined weight of the Servo Hoist and load. Do not use a supporting structure that tilts the Servo Hoist to one side or the other.

For safe and proper installation into a rail system, refer to the installation manual provided by the rail system manufacturer.

When installation is complete and prior to placing the Servo Hoist into operation, inspect the Servo Hoist following the instructions in section 4.4.2.1 "Recommendations for Periodic Inspections" of the "Maintenance" portion of this manual.

A. Introduction

Prior to installing and operating the Knight Servo Hoist, all operators using this device should be familiar with the main components of the lifting system. (Refer to Figure 2-1)

Servo Hoist: The Servo Hoist assembly is a powered lifting device. The upper drive assembly contains the servo motor with holding brake, gearbox, servo drive, power contactor, 24 VDC Power Supply, regen board, chain bucket, chain guide assembly, and AC Plug.

Coiled Cable Assembly: In most cases, a 19-pin coil cable carries signals from the control handle to the Servo Hoist. Some examples are: Analog load cell voltages, digital inputs and outputs including direction commands, Lift Mode, Float Mode, and Run-Stop signals. In some cases, a 19-pin strait cable carries some or all of these signals to the Servo Hoist.

Load Monitoring Module (LMM): The LMM provides weight feedback to the servo hoist. Both the load and safety chains are attached to a load clevis located at the top of the LMM. The fixture or part is suspended from the bottom the LMM.

Operator Control Interface (OCI): The OCI provides operator feedback to the servo hoist. The OCI includes a red Run-Stop LED / pushbutton, green LED / pushbutton, blue LED / pushbutton, 19-pin coil cable connector, ethernet programming port and I/O connectors.

Control Handle: The main movement interface between the operator and the lifting device. The handle can be an inline handle, a fixture handle, or a discrete up / down handle.

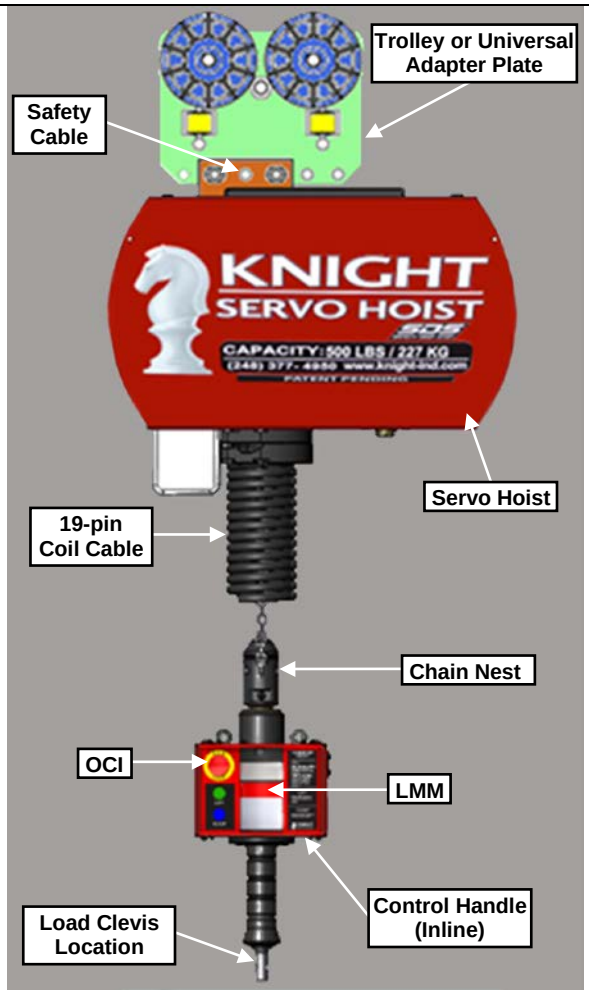


Figure 2-1

B. Initial Setup

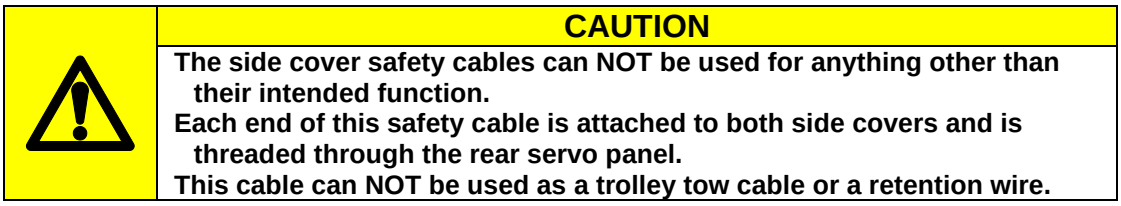
Step 1: Unpacking

1) Unpack the Servo Hoist. Lift the hoist carefully out of packaging.
2) Keep the accompanying documents with the hoist or near the site of operation.

Step 2: System Assembly

Knight Servo Hoists are typically delivered pre-assembled; if not, read the following sections.

2a) Servo Hoist Trolley Installation
2b) Safety Cable Installation
2c) 19-pin Coil Cable Installation
2d) 4mm and 5mm Chain Installation



Step 2a) Servo Hoist Trolley Installation:

Prior to installation visually inspect the trolley for signs of damage or missing parts.

1) Slide the trolley or adapter plate into the trolley mounting plate on top of the Servo Hoist. (Refer to Figure 2-2)

CAUTION
Ensure that there is a (2) two-point connection when using the universal adapter plate to hang the hoist from a structure. (Refer to Figure 2-3)

2) Insert the (2) two ½-13x1¾" (grade 8 or better) socket head cap screws (SHCS) and (2) two washers.

NOTE
The load chain should be centered under the midpoint of the trolley.

3) Secure the (2) two SHCS with (2) two ½-13 reverse lock nuts. As each bolt is tightened, the reverse lock nut will get drawn into its slot and get trapped there.
4) Install the safety cable through the servo trolley or adapter and the trolley mounting plate. (Refer to Step 2b "Safety Cable Installation")
5) Roll hoist into rail system.

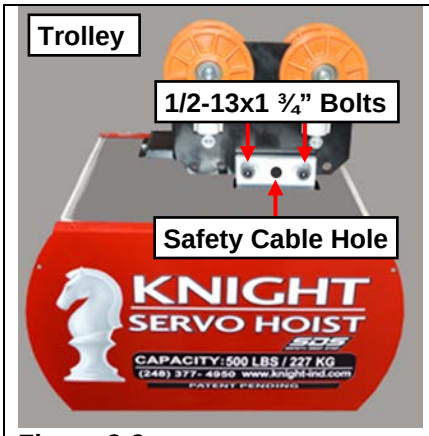


Figure 2-2

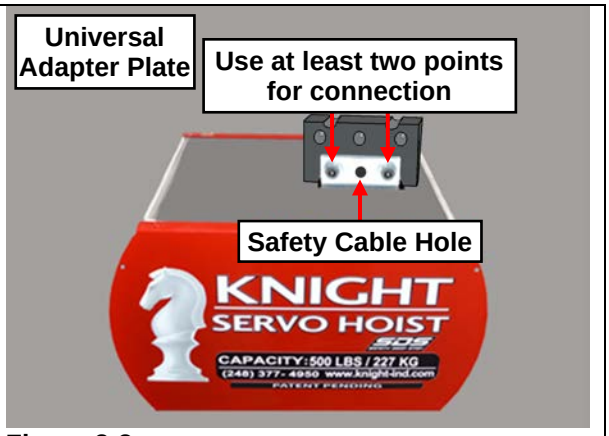


Figure 2-3

Step 2b) Safety Cable Installation:

1) Slide thimbles together. (Refer to Figure 2-4)
2) Slide (2) two Crosby cable clamps onto the cable.
3) Loop the end of cable around thimble and run the end through the Crosby clamps.
   The cable saddle (forged part) rests on the "live" (longer) end of the cable.
   The U-bolt rests on the "dead" (shorter) end of the cable. (Refer to Figure 2-5)
4) Tighten each nut on a single clamp, alternating sides. Repeat this procedure on the other clamp.
   Each nut should be tightened to a minimum of 15 ft-lbs.
5) Follow the steps below for trolley or adapter plate.
6) Insert cable through the center hole on the trolley bracket which is attached to the hoist and place (2) two Crosby clamps on the other end of the cable. (Refer to Figure 2-6)
7) Secure the (2) two Crosby clamps snug to the thimble, repeating step 3.
8) Install the cable so that the Servo Hoist has a drop of not more than 1 in. [2.54 cm].
9) Trim excess cable and tape ends of cable to prevent fraying. (Refer to Figure 2-7)

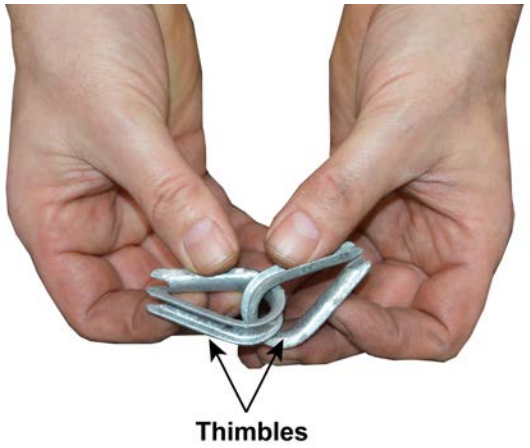


Figure 2-4

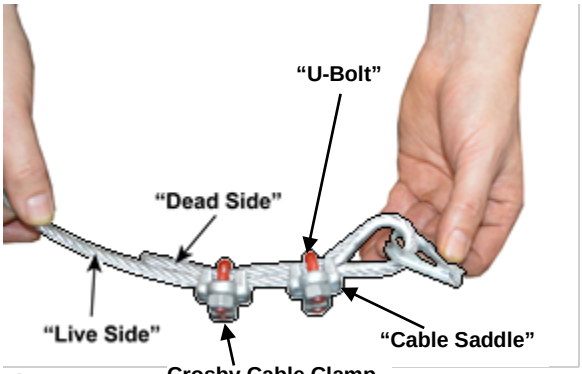


Figure 2-5

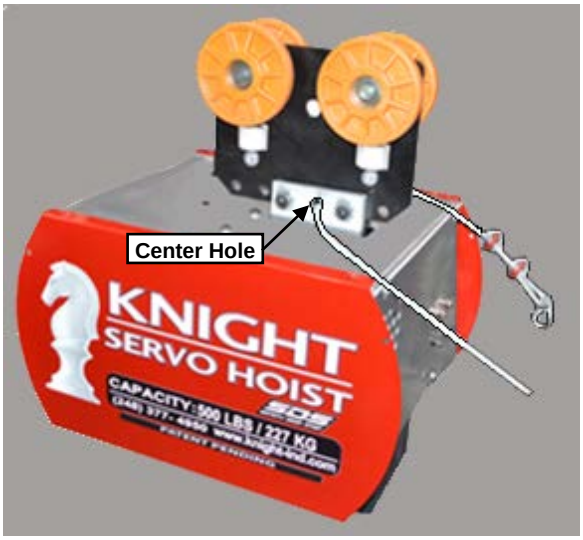


Figure 2-6

Figure 2-7

Step 2c) 19-pin Coil Cable Installation:

1) Ensure power is removed from hoist.
2) Slide the 19-pin coil cable upward over the chain and into the clamping assembly.
3) Secure the (4) four M6 nuts onto the bolts that pass through the clamping assembly from the bottom of the Servo Hoist. (Refer to Figure 2-8)
4) Connect the 19-pin connector to the bottom of the Servo Hoist. (Refer to Figure 2-9)
5) Seat both chains into the control handle's chain nest. Secure both chain's retaining bolts through the provided holes in the chain nest. (Refer to Step 2d "4mm and 5mm Chain Installation")
6) Loosen the (2) two M4 screws holding the 19-pin receptacle and slide it out of the control handle's housing. (Refer to Figure 2-10)
7) Connect the 19-pin connector to the receptacle, slide it back into the control handle's housing and secure the (2) two M4 screws. (Refer to Figure 2-11)
8) Secure the (2) two M6 bolts for each of the handle coil cable clamping rings located on top of the control handle. (Refer to Figure 2-10)

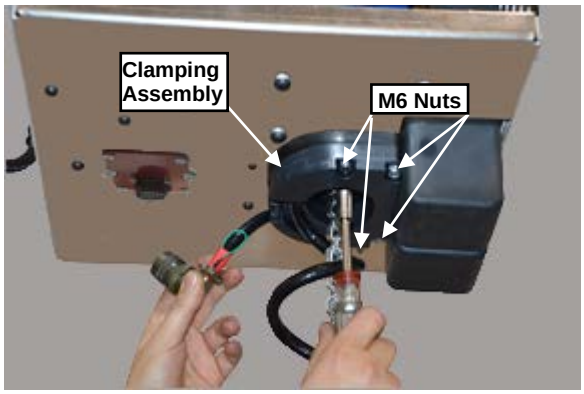


Figure 2-8

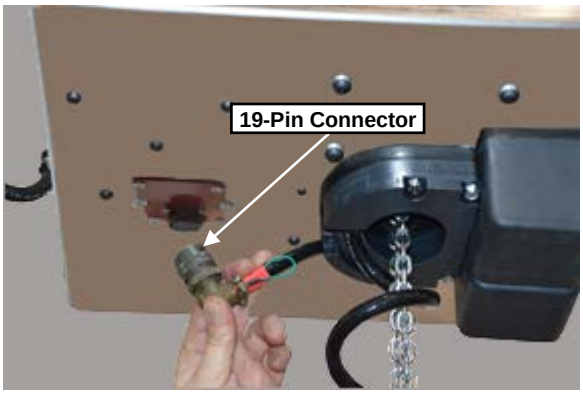


Figure 2-9

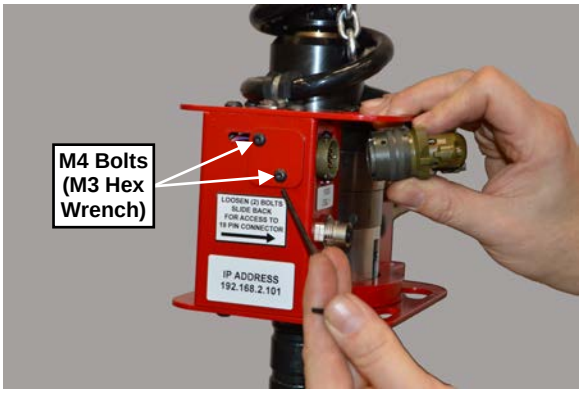


Figure 2-10

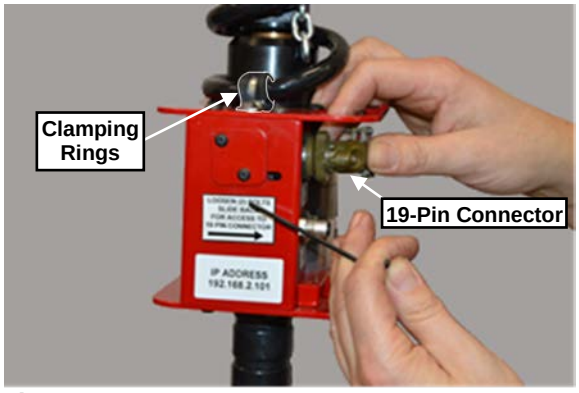


Figure 2-11

Step 2d) 4mm and 5mm Chain Installation:

⚠	**CAUTION** **DO NOT CUT CHAIN TO SHORTEN IT! The chain will be reeled into the hoist in Section 2, Step 5 "Control Handle Set-up".**

1) Thread both chains through the coil cable.
2) Place the load chain into the top portion of the chain nest and insert the bolt provided thru chain nest in front of load chain's last link. A M4 Hex wrench is required if the servo's capacity is 250 or 500lbs. Otherwise, both M4 and M5 Hex wrenches will be required. (Refer to Figure 2-12)
3) Ensure that both chains are parallel with no twists from the gear box down to the chain nest.
4) Install the last link of the Safety Drop Stop (SDS) chain into the lower portion of the chain nest in front of the load chain. Ensure that the SDS chain is kept parallel to the load chain.
5) Install the bolt provided into the bottom bolt hole in the chain nest and through the last link in the SDS chain. (Refer to Figure 2-13)
6) Ensure that the large O-ring is fitted into the groove of the chain nest and the small O-ring is just above the chain nest but below the safety chain ID tag. (Refer to Figure 2-14)
7) Figure 2-15 shows the completed installation of both chains into the chain nest.

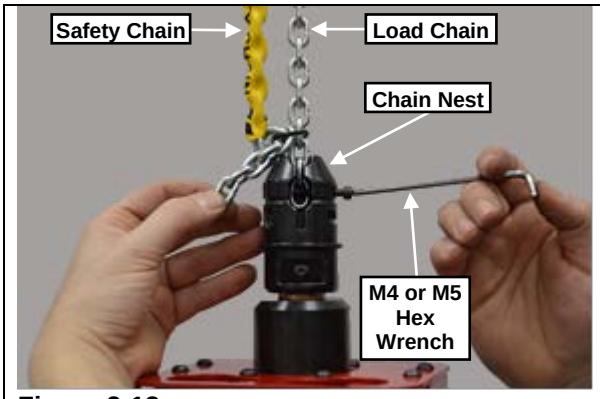


Figure 2-12

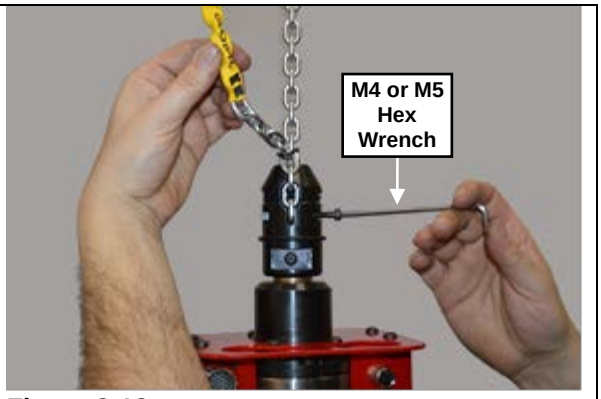


Figure 2-13

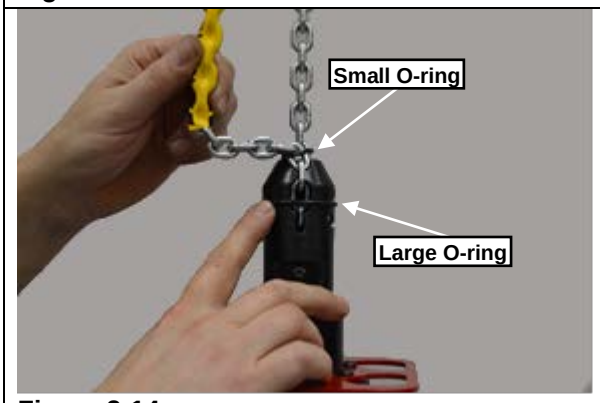


Figure 2-14

Figure 2-15

Step 3: Power Supply to Servo Hoist

Prior to installation visually inspect the Servo Hoist for signs of damage or missing parts.

Power Requirements: Call a Knight Representative to obtain the correct power requirements for your system.
Standard: 240 VAC, Single Phase, 50/60 Hertz.

Refer to system specific documentation for any special power requirements.

1) The Servo Hoist power is connected by a twist lock plug (Refer to Figure 2-16: Standard) or fed by a hard-wired circuit, provided by end user (Refer to Figure 2-17: CE Compliant).
2) After power has been applied and the servo has finished its boot-up sequence, the red light on the Run-Stop button will illuminate.

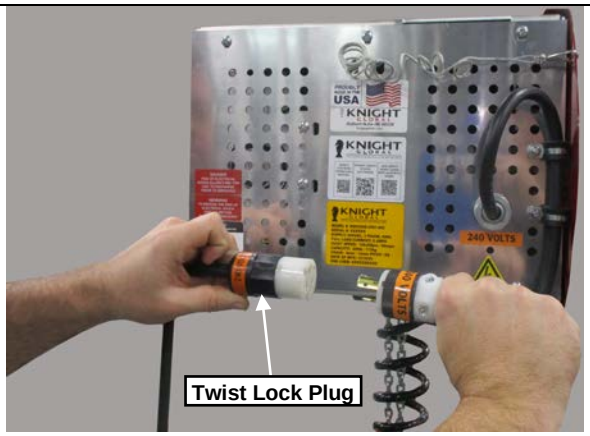


Figure 2-16: Standard

Figure 2-17: CE Compliant

Step 4: Releasing the Run-Stop button

The Run-Stop button is engaged for shipping purposes.

1) Turn the Run-Stop button a quarter of a turn clockwise to release the Run-Stop and wait for red light to turn off. (Refer to Figure 2-18)
2) Please, refer to the Run-Stop mode functionality in section 3.C. “Servo Hoist Functionality Modes” of this manual for more information.

Figure 2-18

Step 5: Control Handle Set-up

There are (4) four control handle configurations. This section discusses the correct setup of each of these.

5a) Inline Handle setup
5b) Fixture Handle setup
5c) Discrete Up / Down Handle setup
5d) Digital Wireless Remote Up / Down Controller with Run-Stop

Step 5a) Inline Handle setup:

1) Hold the inline handle and trigger with one hand, and hold the chain away from the inline handle with other hand. (Refer to Figure 2-19)
2) Apply upward pressure on inline handle until the green light flashes.
3) Once green light starts flashing, release the inline handle and the GREEN light will illuminate.
4) Grasp the inline handle and apply upward pressure until the chain starts feeding into the hoist. Continue this until the inline handle is hanging vertically from the hoist at a comfortable height.

Figure 2-19

Step 5b) Fixture Handle setup:

1) Set-up the fixture handle into the orientation in which it will be used in the application. Refer to the layout drawings for the application to determine this. (Refer to Figure 2-20)
2) Apply upward pressure on fixture handle until the green light on the Operator Control Interface (OCI) flashes. (Refer to Figure 2-21)
3) Once green light starts flashing, release the fixture handle and the GREEN light will illuminate.
4) Grasp the fixture handle and apply upward pressure until the chain starts feeding into the hoist. Continue this until the fixture is hanging from the hoist at a comfortable height.

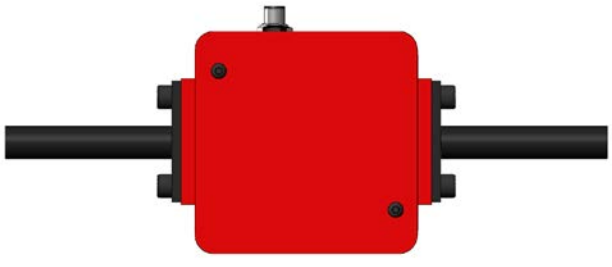


Figure 2-20

Figure 2-21

Step 5c) Discrete Up / Down Handle setup:

1) Press the Up lever until the green light on the Operator Control Interface (OCI) starts to flash. (Refer to Figure 2-22)
2) Once the green light starts flashing, release the Up lever and the GREEN light will illuminate.
3) Press the Up lever again until the chain starts feeding into the hoist. Continue this until the fixture is hanging from the hoist at an acceptable height.

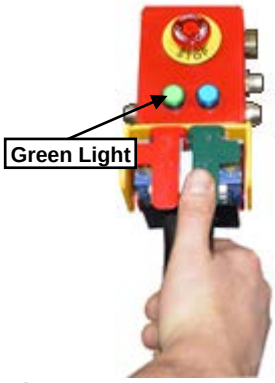


Figure 2-22

Step 5d) Digital Wireless Remote Up / Down Controller with Run-Stop:

1) Turn power switch from the 'OFF' position to the 'ON' position.
2) Turn the power switch from the 'ON' position to the momentary 'START' position. The switch will spring back to the 'ON' position. (Refer to Figure 2-23)
3) Press the Up button until the green light on the Operator Control Interface (OCI) starts to flash. (Refer to Figure 2-24)
4) Once the green light starts to flash on the OCI, release the Up button until the green light illuminates.
5) Press the Up button again until the chain starts to feed into the hoist. Continue holding the Up button until the fixture is hanging from the hoist at an acceptable height.

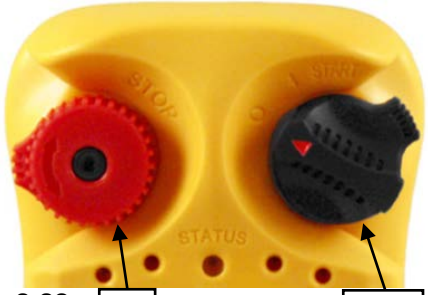


Figure 2-23

Figure 2-24

NOTE

A continuously flashing GREEN light indicates a safe start activation fault. The system is sensing commanded motion during the Power-Up sequence.

Remedy

Analog Handle: Release the handle and verify that the GREEN light illuminates solid. If the GREEN light still flashes after the handle is released, refer to section 7. "Troubleshooting".

Up/Down Pendant: Release both buttons and verify that the GREEN light illuminates solid. If the GREEN light still flashes after the button is released, refer to section 7. "Troubleshooting".

Step 6: Test Hoist Movement

Test the Servo Hoist movement by applying upward and downward pressure on the inline or fixture handle. If the system uses a discrete Up / Down handle, press the Up and Down levers to move the fixture up and down.

Step 7: Back-Up Software

Knight Servo Hoists are pre-programmed prior to delivery. It is a good practice to back-up this software before initial operation. Refer to section 5.B. “Connecting to a Servo Hoist” for instructions on how to connect a laptop to the Servo Hoist and section 5.C. “Backing up the Knight Servo Hoist Software” on how to back-up the servo’s software.

Step 8: Software Adjustments (If necessary)

After making a back-up of the software in step 7, it may be necessary to adjust certain parameters in the software to ensure that the servo performs correctly for a specific application. Refer to the following first-time adjustments in section 5. ‘Software’.

- Verify the hoist’s maximum weight. This is also known as the Up Stop weight of the hoist.
- Verify the hoist’s minimum weight. This is also known as the Down Stop weight of the hoist.
- Verify the hoist’s fixture weight.
- Verify that the analog handle is balanced.
- Verify that the encoder offset is correct.

3. OPERATION

A. Principle of Operation

The Servo Hoist system receives a command to move up or down along the “Z” axis from any input force applied to the handles or by pressing the Up or Down levers.

B. Model Number

The Servo Hoist model number designates the Servo Hoist type and its specifications. (Refer to Figure 3-1)
The first set of letters indicate the type of Servo Hoist. Please refer to Table 3-1 for the Servo Hoist Type prefix letters.
The numbers following the Servo Hoist Type prefix letters reference the system’s rated capacity.
Next, we have an “S” to designate our Safety Drop Stop feature.
The next (3) three numbers express the voltage and the following number indicates the phase of the system.
The last (3) three digits are an inhouse control servo code.

The hoist’s model number and serial number can be found on the Knight identification label located on the Servo Hoist.

Letters	Servo Hoist Type *
KSH	Single Chain
KSHxxxxDS	D-Series
KSHxxxxSS	Speed
KSHTC	Twin Chain
KSHTCDM	Twin Chain Dual Motor
KSHFA	Floor Mounted Articulating Arm
KSHCA	Overhead Carriage Articulating Arm
KSHEA KSHAEA	Extension Arm
KSHEB KSHAEB	Extension Boom Arm
KSHVA KSHVAA	Vertical Arm
KSHVAR KSHVAAR	Vertical Roller Arm
KSHXZ	Servo Hoist and Tractors with X and Z Movement
KSHXYZ KSHXXYZ	Servo Hoist and Tractors with X, Y, and Z Movement

Table 3-1

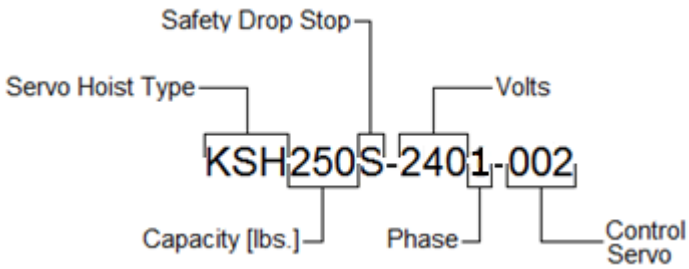


Figure 3-1: Servo Hoist Model Number Example **

* For all models and specifications, refer to the website:
https://knightglobal.com/product/safety-drop-stop-servo-hoist/

** All Knight Servo Hoists that utilize a linked chain include a Safety Drop Stop chain that travels with the load chain to support the fixture in the event of a catastrophic load chain failure.

Servo Hoist Control Configurations

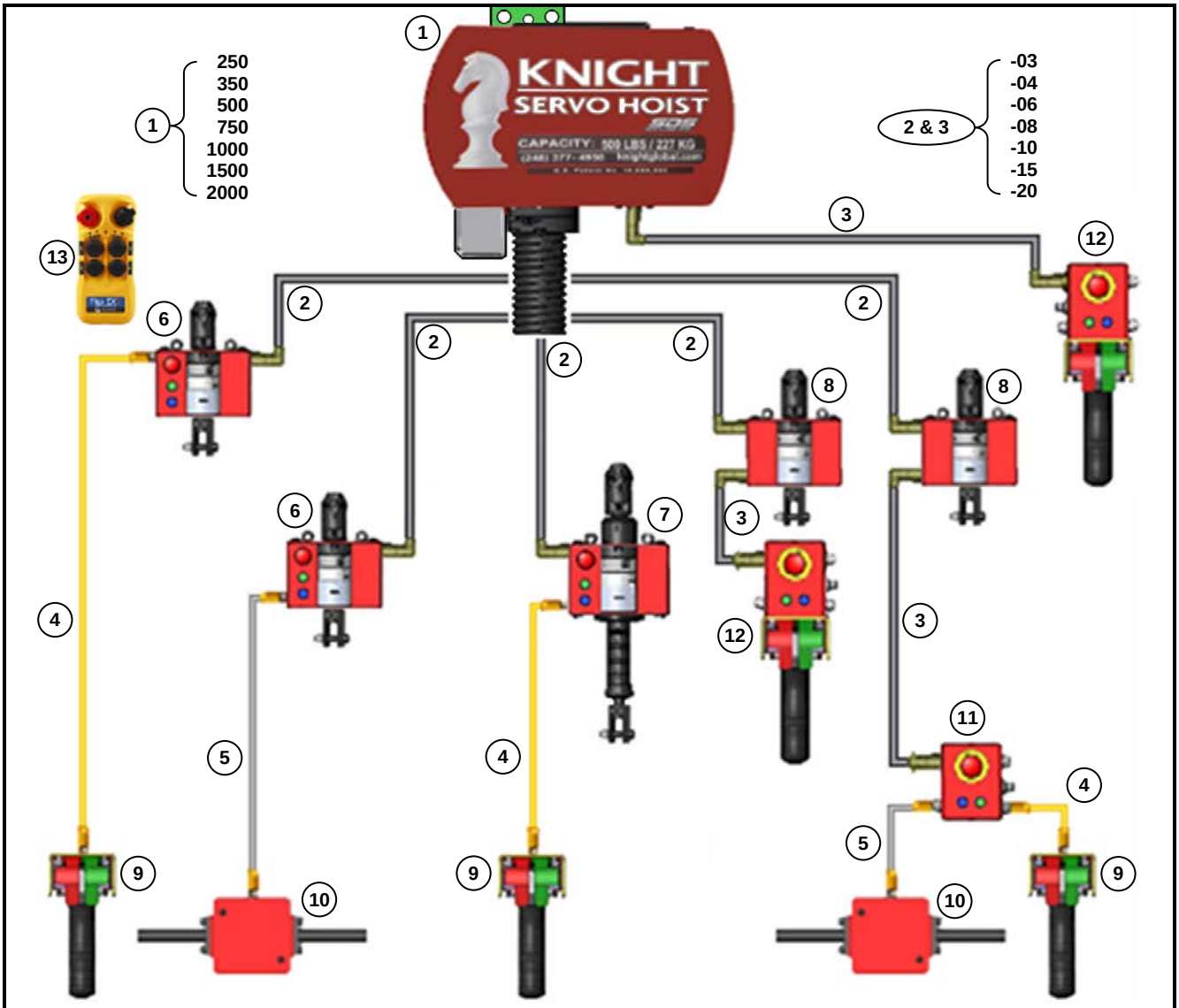


Figure 3- 2

NUMBER	DESCRIPTION
1	KNIGHT SERVO HOIST (xxxx = CAPACITY in LBS.)
2	KNIGHT 19-PIN COIL CABLE (xx = FT.)
3	KNIGHT 19-PIN STRAIGHT CABLE (xx = FT.)
4	4-PIN CABLE (STANDARD LENGTHS)
5	8-PIN CABLE (STANDARD LENGTHS)
6	KNIGHT LOAD MONITORING MODULE WITH OPERATOR CONTROL INTERFACE (OCI)
7	KNIGHT ANALOG INLINE HANDLE
8	KNIGHT LOAD MONITORING MODULE (LMM)
9	KNIGHT DUAL SPEED HANDLE PENDANT
10	KNIGHT FIXTURE HANDLE WITH INTERNAL LOAD CELL
11	KNIGHT OPERATOR CONTROL INTERFACE (OCI)
12	KNIGHT DUAL SPEED HANDLE WITH OPERATOR CONTROL INTERFACE (OCI)
13	KNIGHT WIRELESS REMOTE MODULE

C. Servo Hoist Functionality Modes

Run-Stop

Step 1. Press the RUN-STOP button, located on the Operator Control Interface (OCI) module.

- Drive's STO is active and the holding brake is set.
- The Run-Stop button will turn on solid red.

Recovery:

Step 1. Reset the RUN-STOP button by twisting it a quarter of a turn clockwise.

Shut Down

Step 1. Press the RUN-STOP button, located on the Operator Control Interface (OCI).

Step 2. Follow the warning labels on the Servo Hoist and disconnect the power supplied to the unit.

Start Up

Step 1. Connect the power supply to the unit.

Step 2. Reset the RUN-STOP button by twisting it a quarter of a turn clockwise.

- The hoist will power up and depending on the hoist's configuration:
  i. Inline handle, the OCI's RED and GREEN indications will briefly flash when the system is ready to function.
  ii. Fixture or Digital Handle, no OCI lights flash.
- The unit will then default to No Mode: the OCI's GREEN, BLUE, and RED indicators will turn off.

No Mode

When the Servo Hoist powers up or if it is inactive for a continuous time period, the unit will shift to this energy saving mode. The factory default time period is 10 minutes.
The holding brake will engage and power will be removed from the motor while No Mode is active.
When the unit is in No Mode, the OCI's GREEN, BLUE, and RED indicators will be off.

Lift Mode

Press the GREEN (Lift) button to place the Servo Hoist into Lift Mode.

- The GREEN (Lift) indicator will illuminate.

	NOTE
	**A continuously flashing GREEN light indicates a safe start activation fault. The system is sensing commanded motion during the Power-Up sequence.** **Remedy** **Analog Handle: Release the handle and verify that the GREEN light illuminates solid. If the GREEN light still flashes after the handle is released, refer to section 7. "Troubleshooting".** **Up/Down Pendant: Release both buttons and verify that the GREEN light illuminates solid. If the GREEN light still flashes after the button is released, refer to section 7. "Troubleshooting".**

Systems with Inline or Fixture Handle Style Lift Controls:

Step 1. Apply force to the handle in the desired direction of travel (upward or downward). The travel speed of the fixture is proportional to the force applied to the handle.

Systems with Discrete Up / Down Style Lift Controls:

Step 1. Press the Up or Down button to move the hoist in the desired direction.

	NOTE
	**If the hoist is in No Mode and a lift command is given to the system, the hoist will automatically go into Lift Mode.**

Float Mode

Step 1. Press the BLUE (Float) button to place the Servo Hoist into Float Mode.
When the BLUE button is pressed, a snapshot is taken of the load suspended from the bottom of the load cell.
The BLUE (Float) indicator will illuminate.

Step 2. Apply pressure to the top of the part to move it down or lift up on the part to move it up.
Do not use the lift controls to move the part as this will place the hoist back into Lift Mode.

WARNING

An operator should never be able to release a load while in Float mode. The operator must switch to Lift mode in order to release a load.

NOTE

If the Knight controls team programmed the hoist, it will never release or unclamp a part while it is in Float mode. The hoist will have to be switched to Lift mode for a part to be released or unclamped.

To change from Float Mode to Lift Mode, follow any of the steps below:

- Operate the lift controls. The hoist will automatically change to Lift Mode.
- Press the GREEN (Lift) push button and the unit will change into Lift Mode.
- Allow the Float Mode Timeout timer to expire. This timer is set at the factory to 10 minutes of non-use. To change this timer, refer to section 6. 'Variable Descriptions' in the Software section.

NOTE

The part must be picked up while the hoist is in Lift Mode and then the operator may place the Servo Hoist into Float Mode.

NOTE

Do not rest your hand on the part when pressing the Float push button. This can cause a bias or an incorrect zero value measurement to be processed and may cause unintended movement.

NOTE

Use of the Lift Mode controls will prevent the unit from remaining in or changing to Float Mode.

Travel Limits

The user-defined top (Upper) and bottom (Lower) travel limits are listed on either of two screens depending on what mode the servo is in:

For Lift mode:

Located here: KSS Workspace tree location: Knight WO# \ Setup \ Lift Mode Travel Limits.

For Float Mode:

Located here: KSS Workspace tree location: Knight WO# \ Setup \ Float Mode Travel Limits.

NOTE
During operation (Lift or Float Mode) the hoist will ramp down in speed as the travel limits are approached.

NOTE
The absolute upper and lower travel limits are factory set to the physical limits of the Servo Hoist. Contact a Knight Global Representative for information regarding changes to these absolute limits.

Fault Mode

The Red light will flash.

Step 1. Press the RUN-STOP button, located on the Operator Control Interface (OCI).

- Drive's STO is active and the holding brake is set.
- The Run-Stop button will turn on solid red.

Recovery:

Step 1. Correct the situation that caused the fault.
Refer to section 7.B. "System Activity screens including Faults, Warnings and Error Codes" for a list of common faults.

Step 2. Cycle the Run-Stop button.

4. MAINTENANCE

A. CHAIN INSPECTION

4.1 Inspection Overview

The inspection procedures and recommendations in this manual are based on:

- ANSI/ASME B30.16 "Overhead Underhung and Stationary Hoists"
- ISO7592-1983 "Calibrated Round Steel Link Lifting Chains – Guidelines to proper use and maintenance"

The following definitions and recommendations are from both specifications and pertain to the recommended inspection procedures in this manual.

Qualified Person: A person who, by possession of a recognized degree in an applicable field, or certificate of professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter at work.

Designated Person: A person selected or assigned by the employer or the employer's representative as being competent to perform specific duties.

Abnormal Operating Conditions: Environmental conditions that are unfavorable, harmful, or detrimental to the operation of a hoist, such as excessively high or low ambient temperatures, exposure to weather, corrosive fumes, dust laden or moisture laden atmospheres, and hazardous locations.

4.2 Use of Chain Safely in Any Application

Balance: Know the Load - determine the weight, center of gravity, angle and lift.	
Overload: Never Overload the Chain - check the working load limit on the identification tag.	
Knots, Twists and Kinks - Ensure chain is not twisted, knotted, or kinked before lifting load. Chains should not be shortened with knots, bolts, or other make-shift devices.	
Sharp Edges - Protect chain with padding when lifting sharp edged loads.	
Abrupt Movement - Lift and lower loads smoothly. Do not jerk.	
Extreme Temperatures - Do not expose alloy chain to temperatures of 400°F or higher or -40°F or lower.	

Figure 4-1

4.3 Determining the Frequency of Chain Inspections

Knight recommends utilizing load criteria and duty cycle data when determining the frequency of inspections. Inspection frequency should be identified by a qualified person and is based on factors such as the severity of the environment the hoist is being used in, percentage of capacity lifts, cycle time and shock loading.

Each Servo Hoist should be rated individually and inspections performed in accordance with that rating.

Proper maintenance depends on an evaluation of the severity of usage to which the hoist and the chains are subjected to in the specific application.

The overall determination of how often the hoist and chains should be inspected is a combination of its Service Rating Load Criteria (4.3.1) and its Service Class or Duty Cycle (4.3.2).

4.3.1 Service Rating Load Criteria

Light Service: The Hoist is normally subjected to 25% of its maximum capacity.

Moderate Service: The Hoist is normally subjected to 50% of its maximum capacity.

Heavy Service: The Hoist is normally subjected to 75% of its maximum capacity.

Very Heavy Service: The Hoist is normally subjected to 90% of its maximum capacity.

4.3.2 Service Class (Duty Cycle)

Service Class is determined by the total number of cycles the system has performed. (Table 4-1)

- Service Class 0: 0 to 20,000 loaded cycles.
- Service Class 1: 20,001 to 100,000 loaded cycles.
- Service Class 2: 100,001 to 500,000 loaded cycles.
- Service Class 3: 500,001 to 2,000,000 loaded cycles.
- Service Class 4: over 2,000,000 loaded cycles.

Cycles Per Day	Desired Life (Years)				
	1	**5**	**10**	**20**	**30**
5	0	0	0	1	1
10	0	0	1	1	2
25	0	1	1	2	2
50	0	1	2	2	3
100	1	2	2	3	3
200	1	2	3	3	4
300	2	3	3	4	4
750	2	3	4	4	4
1,500	3	4	4	4	4

Table 4-1: Service Class

Example: If the system is performing 100 cycles per day, it will progress though Service Classes during its use:

1 year	26,000 cycles	Service Class 1
5 years	130,000 cycles	Service Class 2
10 years	260,000 cycles	Service Class 2
20 years	520,000 cycles	Service Class 3
30 years	780,000 cycles	Service Class 3

4.4 Type of Inspections

The inspection procedure is divided into two general classifications based upon the intervals at which the inspections should be performed for the hoist and chains during regular use.
The general classifications are herein designated as "frequent" and "periodic" with respective intervals between inspections as defined below.

In addition, visual observations shall be conducted during regular service for any damage or evidence of malfunction which might occur between regular inspections.

4.4.1 Frequent Inspection (Visual)

This is a visual examination of the hoist and its chains by the operator or other designated personnel, without requiring records to be made. This inspection should be carried out at the following intervals:

A.	Light Service	or	Service Class 0 / 1	– **Every Month**
B.	Moderate Service	or	Service Class 2	– **Every Two Weeks**
C.	Heavy Service	or	Service Class 3	– **Every Week**
D.	Very Heavy Service	or	Service Class 4	– **Every Day**

Additionally, the operator should check the system continually during operation to ensure that no malfunctions are occurring (such as abnormal noises or binding of the chain).

4.4.1.1 What to Look for During a Frequent Inspection

Operator should examine the chain throughout its working length to detect any evidence of wear, distortion, or external damage.
Equipment should be operated under a load as near as possible to the usual operating load, in both directions and observe the functioning of the chain. The chain should feed smoothly into and out of the servo.
Additionally, the operator should check the system continually during operation to ensure that no malfunctions are occurring.

- Check for visual signs or abnormal noises (grinding etc.) which would indicate a potential problem.
- Ensure controls function properly and return to neutral when released.
- Ensure the load chain feeds through the hoist correctly.
- Ensure that the chain doesn't bind, it is not excessively noisy or it doesn't "click" as it leaves the bottom of the servo.

If any of these abnormal conditions are evident, the Servo Hoist should be taken out of service and a detailed inspection and corrective actions should be taken by qualified maintenance personnel.

4.4.2 Periodic Inspection (Documented)

This is a thorough examination of the hoist and its chains conducted by a qualified person, making records of external conditions to provide a basis for the hoist's continuing evaluation.

This Inspection should be carried out at the following intervals:

A. Light Service or Service Class 0/1 – **Yearly**
(equipment remains in place).

B. Moderate Service or Service Class 2 – **Every Six Months**
(equipment remains in place unless external conditions indicate that disassembly should be done to permit detailed inspection).

C. Heavy Service or Service Class 3 – **Every Three Months**
(equipment remains in place unless external conditions indicate the disassembly should be done to permit detailed inspection).

D. Very Heavy Service or Service Class 4 – **Every Six Weeks**
(equipment remains in place unless external conditions indicate that disassembly should be done to permit detailed inspection).

4.4.2.1 Recommendations for Periodic Inspections

Perform the inspection detailed under section 4.4.1.1 "What to Look for During a Frequent Inspection" of this manual.

Next, the chains should be cleaned for inspection, using any cleaning method that will not cause damage.
Adequate lighting should be provided for the person inspecting the chain.
The chain should be examined link by link for cracks, gouges, nicks, distortion, corrosion, deposits of foreign material, and for interlink wear.
To inspect for wear at the interlink contact points, slack the chain, and rotate adjacent links to expose the inner surface of the link. If wear is observed or if elongation is suspected, measure the chain using Knight's Load Chain Gauge (KSAA1033).

A. Chain Link Thickness

If chain is worn to less than the minimum allowable thickness (T), remove the chain from service. (Refer to Figure 4-2)

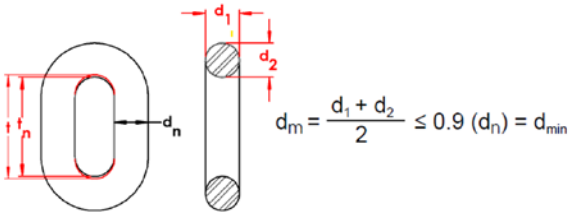


Figure 4-2

	4mm Chain Dimensions (mm)	5mm Chain Dimensions (mm)	7mm Chain Dimensions (mm)
t_n = Pitch (nominal)	12	15.1	21.25
d_n = Diameter (nominal)	4	5	7.1
t_{max} = Pitch (max)	Replace if ≥ 12.6	Replace if ≥ 19.86	Replace if ≥ 22.31
d_{min} = Diameter (min)	Replace if ≤ 3.6	Replace if ≤ 4.5	Replace if ≤ 6.4

Table 4-2: Chain Link Thickness

B. Chain Gauge Replacement Measurement for 4mm, 5mm and 7mm Load Chains

1. Determine which type of chain is being inspected, either 4mm, 5mm or 7mm, by placing a single link into the chain gauge where the arrows are located. (Refer to Figure 4-3)
2. Raise the hoist to the full up position and mark the chain.
3. Lower the hoist to the full down position.
4. Select 13 links starting with the link that was marked in step 2.
5. The 13-selected links should fit loosely onto gauge's prongs as shown below.
6. Replace the load chain if the links do not fit onto the prongs or must be forced onto the gauge. This indicates that the chain's length has increased by 2% or more and should be removed from service and replaced with a new chain.
7. Perform this inspection in multiple sections of the chain working up to the sprocket.

   NOTE: For the 7mm chain, select 7 links and follow the steps.

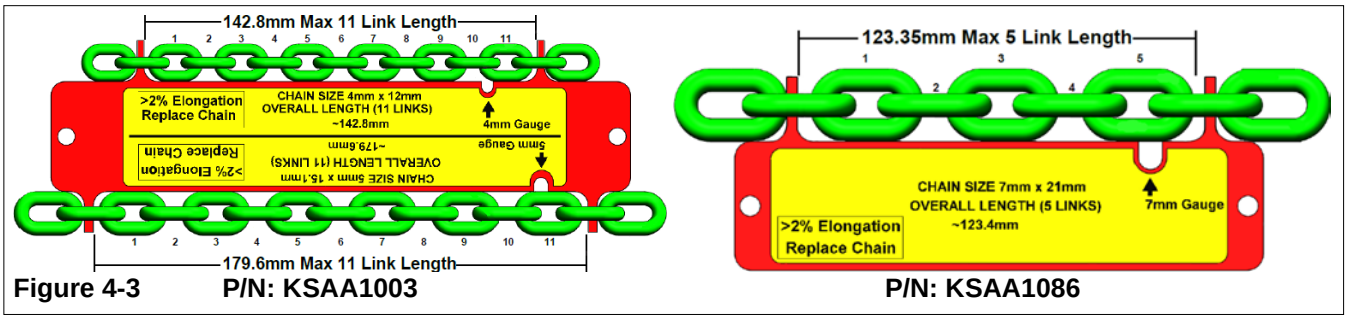


Figure 4-3 **P/N: KSAA1003** **P/N: KSAA1086**

C. If Chain Gauge is Not Available

1. Select the portion of chain just above the Load Monitoring Module (LMM); this will be an unworn, un-stretched length of the load chain.
2. Suspend the chain vertically under tension. Use a caliper type gauge to measure the accumulated pitch of between 5 and 13 links.
3. Measure the same number of links throughout the used chain and calculate the percentage increase in length.
4. The chain should be replaced if the gauge length measured over any 5, 7, 9, 11, or 13 links as appropriate exceeds that of the unused chain by 2%.

D. Rejection Criteria

The chain should be rejected and replaced if any of the following conditions are observed: (Refer to Figure 4-4)

- Cracked or worn links.
- Severe nicks or gouges.
- Twisted or bent links.
- Severe corrosion.
- Deposits which cannot be removed.
- Increase in gauge length which exceeds the manufacturer's recommendations. In the absence of manufacturer's recommendations, the chain should be replaced if the gauge length measured over any 5, 7, 9, 11, or 13 links as appropriate exceeds that of the unused chain by 2%.

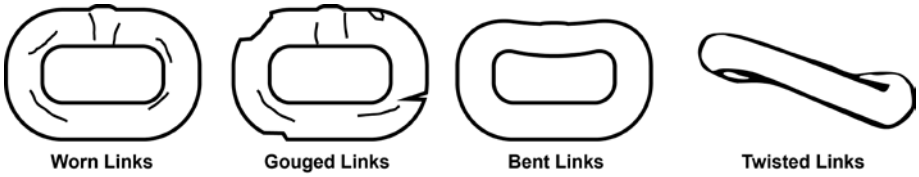


Figure 4-4

4.4.2.2 Recommended Record Keeping for Periodic Inspections

Adequate records as a part of periodic inspection are essential for the proper use of calibrated chains. The chain record should include a complete description and identification of the new chain, the date and results of each inspection, the date and results of each test and the date and description of any maintenance.

The record is a continuous history of the chain and shows that it has been regularly inspected and maintained in good operating condition.

When the chain is removed from service, a new record should be prepared for the replacement chain.

4.4.3 Chain Lubrication:

Keep chain well lubricated. Never operate a hoist when the load chain does not flow freely and smoothly into and out of the gear box assembly or when it makes noises indicative of binding or other malfunctions. Replace the chain if it is visibly damaged in any way.

Clean, lubricate, and inspect the load chain based on the frequent and periodic inspection criteria described in sections 4.4.1 and 4.4.2. In a corrosive environment, lubricate more frequently than normal.
Failure to maintain a clean and well lubricated load chain will result in rapid load chain wear that can lead to chain failure which can cause severe injury, death, or substantial property damage.

If required, clean the chain with acid free solvent to remove rust or abrasive dust buildup before the chain is lubricated.

Prior to installation, the chain must be lubed. Knight Global recommends the use of Chain grease. The part number of the Chain grease tube is: 665 009 44.
If Chain grease is not available, SAE 50 to 90 EP oil or equivalent may be used.
(Refer to Figure 4-5: Chain Lubrication – P/N 665 009 44)

Lubricate hook and safety latch pivot points with same lubricant used on the load chain.

Lubricate chain without load on chain. This will allow lube to penetrate between links.

WARNING

Failure to maintain a clean and lubricated load chain will void the manufacturer's warranty.

Figure 4-5: Chain Lubrication – P/N 665 009 44

4.4.4 Load Chain Replacement:

Care should be taken to re-install the chain without any twists down the entire chain's length between the gear box and its anchored end in the chain nest. Proper orientation of the entering link should be established since a twist cannot be corrected except by removing and reinstalling the chain.

Refer to 4.6 "Load and Safety Drop Stop Chain Replacement (Normal Maintenance)" for further instructions on how to replace load chain.

4.4.5 Graphite Lubrication Stick:

The Knight Servo Hoist includes a graphite lubrication stick (Lube Stick) located inside the chain guide.

This Lube Stick helps to keep both the load and safety chains lubricated, but is NOT intended to replace normal lubrication practices.

A new Lube Stick can be “dropped” into the Lube Stick recess hole when there is 2.5” of space left inside the hole. (Refer to Figure 4-6: Graphite Lubrication Stick Location)

The Graphite Lubrication Stick’s replacement number is: KSHD1017.

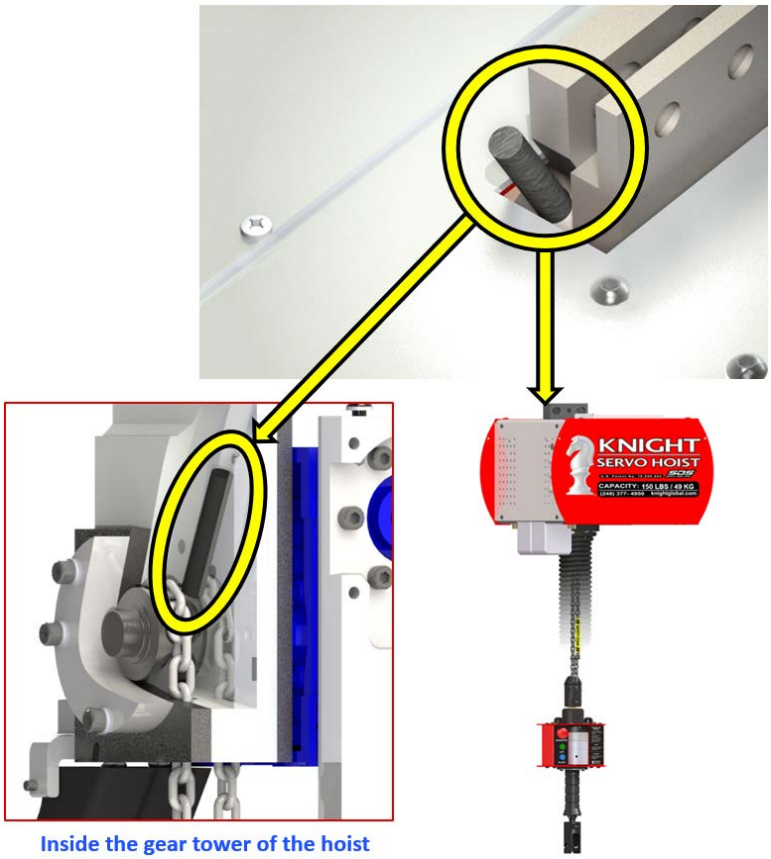


Figure 4-6: Graphite Lubrication Stick Location

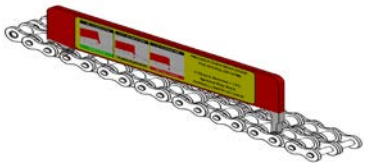
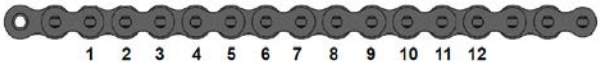
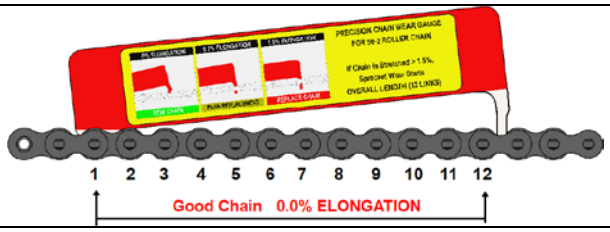
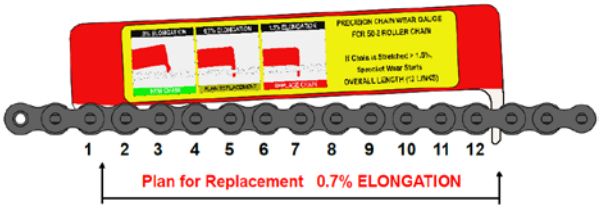
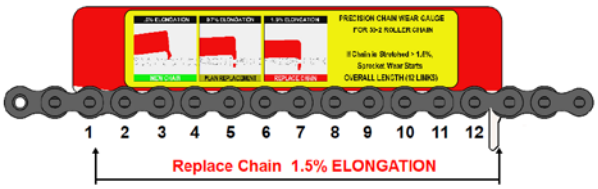
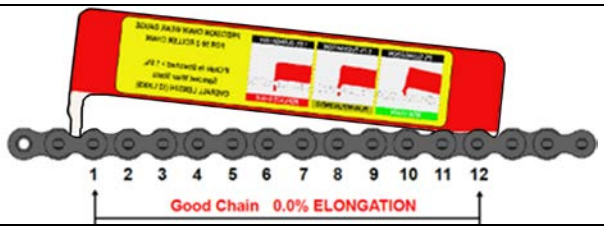
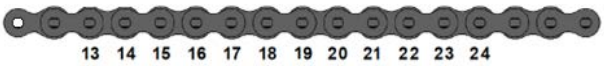
4.4.6 Double Roller Chain:

Over time the chain elongates as it wears leading to a significant increase in actual pitch and potential chain failure. When the normal pitch length has been extended by more than 0.7%, the service life of the chain is significantly reduced and the breaking strength is considerably lower.
At 0.7% elongation a qualified service technician must set a safe time limit for replacement.
At 1.5% the chain must be replaced immediately.

The roller chain should be checked at intervals depending on the service and load conditions. (Refer to section 4.3)

4.4.6.1 Roller Chain Gauge Replacement Measurement

Roller Chains should be cleaned for inspection, using any cleaning method that will not cause damage. The part number for the chain gauge is: KSAA1063.

1. Lower the tool to its lowest point where the entire load is still supported by the chain. Place the End Hook into link #1's roller.	
2. Using the precision chain wear gauge for the 50-2 roller chain, place the gauge on the center of one of the near side links just below the sprocket.	
3. Lower the gauge to check for the percentage of elongation across (12) twelve links of the roller chain.	
4. If the first tab on the gauge contacts the center link, the chain is good. This shows that the roller chain has NOT lengthened in this section of chain.	
5. If the second tab on the gauge makes contact with the link, plan to replace the chain. This shows that the roller chain has lengthened by 0.7% in this section of chain.	
6. If the second tab on the gauge passes through the link, **replace the chain.** This shows that the roller chain has lengthened by **1.5%** in this section of chain.	
7. Repeat the test by placing the gauge in the links on far side of the chain. This shows that the roller chain has NOT lengthened in this section of chain.	
8. Continue checking the chain down its accessible length. When finished, lubricate the roller chain.	

4.4.6.2 Lubricating the Servo Arm Roller Chain

After changing the roller chain, before a test load is lifted, the hoist is put into operation or being put back into normal operation, the chain link contact areas must be lubricated with Chain grease, part no. 665 009 44.

The chain link contact areas must be re-lubricated appropriately – after being cleaned – at intervals depending on the service and load conditions.

Knight recommends the roller chain be lubricated periodically in accordance with section 4.4.3 Chain Lubrication.

Cut off the tip of the grease tube and inject grease into the chain's links by compressing the tube while you run the chain to its end positions to ensure complete and even lubrication of the chain.

B. PREVENTATIVE MAINTENANCE FOR KNIGHT SERVO HOIST

4.5 Servo Hoists Inspections

4.5.1 Recommendations for Frequent Inspections for Servo Hoists (Visual)

This is a visual examination by the operator or other designated personnel, without requiring records to be made. Inspection should be carried out at the following intervals recommended in section 4.4.1 'Frequent Inspection (Visual)'.

Additionally, the operator should check the system continually during operation to ensure that no malfunctions are occurring.

4.5.1.1 Servo Hoist:

- Visually inspect the Servo Hoist and ensure that it is in good general working order. Repair or replace any broken or missing parts.
- Cycle the Servo Hoist and listen for any abnormal noises (grinding, etc.). If any abnormal noises are evident, an inspection of the Servo Hoist must be performed.
- Inspect how the chain feeds through the Servo Hoist. If any binding is evident, clean and lubricate the chain (Refer to section 4.4.2 'Periodic Inspection (Documented)'. If the problem persists replace the chain.
- Cycle the Run-Stop button and ensure it functions correctly.

4.5.1.2 Load Clevis:

- Check the clevis for signs of wear.
- Ensure the load clevis is not cracked, nicked, or gouged. Replace the clevis as necessary.
- Confirm all cotter pins and / or keepers are in place and in good condition.

If any of these abnormal conditions are evident, the Servo Hoist should be taken out of service and a detailed inspection and corrective actions should be taken by qualified maintenance personnel.

4.5.2 Periodic Inspection (Documented)

Perform the items listed in the section 4.4.1.1.
'What to Look for During a Frequent Inspection' in addition to the items listed below.
All findings from this inspection should be recorded.
Website location for the Periodic Inspection checklist:
https://knightglobal.com/?s=Servo+System+Inspection+Checklist&site_section=site-search

4.5.2.1 Supporting Structure:

- Check for distortion, wear, and continued ability to support the load. Refer to manufacturers' instructions for overhead rail systems.

4.5.2.2 Rail Trolley (if applicable):

- Ensure wheels and side rollers run smoothly and are not excessively worn. Replace the wheels and side rollers as necessary.
- Visually check the nylon at the bearing and along the face of the wheel for cracks.

4.5.2.3 Fasteners:

- Check all fasteners and ensure they are not loose, missing, or damaged.

4.5.2.4 Load Hook (if applicable):

- Inspect for cracks, wear, or damage.
- Inspect hook throat for spreading and proper safety latch engagement.
- Measure hook throat at wear points: greater than ten percent wear in any throat zone requires replacement. Refer to manufacturer's instructions for wear zone information.
- Inspect the hook eye or chain nest and sleeve for correct functionality. Also, each should rotate without binding and should not be damaged.

4.5.2.5 Valves, Timers, and Switches:

- Check during an operation cycle to ensure the sequence is operating at optimum efficiency. Repair or replace if needed.

4.5.2.6 Wiring:

- Check for broken, loose, missing, and worn wires. Check all electrical cables for signs of age, wear, or damage, and make sure all connections are tight and secure. Repair or replace if needed.

4.5.2.7 Electrical Enclosures, Disconnect Boxes, and Circuit Breakers:

- Check for obvious signs of damage and repair or replace if needed.
- Verify disconnect is operational. Check for loose, bent, or broken components. Repair or replace if needed.
- Inspect for loose or broken terminals. Check for the presence of contaminants like dirt, dust, grease, or rust. Repair or replace if needed.

If any of these abnormal conditions are evident, the Servo Hoist should be taken out of service and a detailed inspection and corrective actions should be taken by qualified maintenance personnel.

4.5.2.8 Labels and Tags:

- Ensure that all labels are intact and legible. Replace as necessary. (Refer to Figure 4-7)

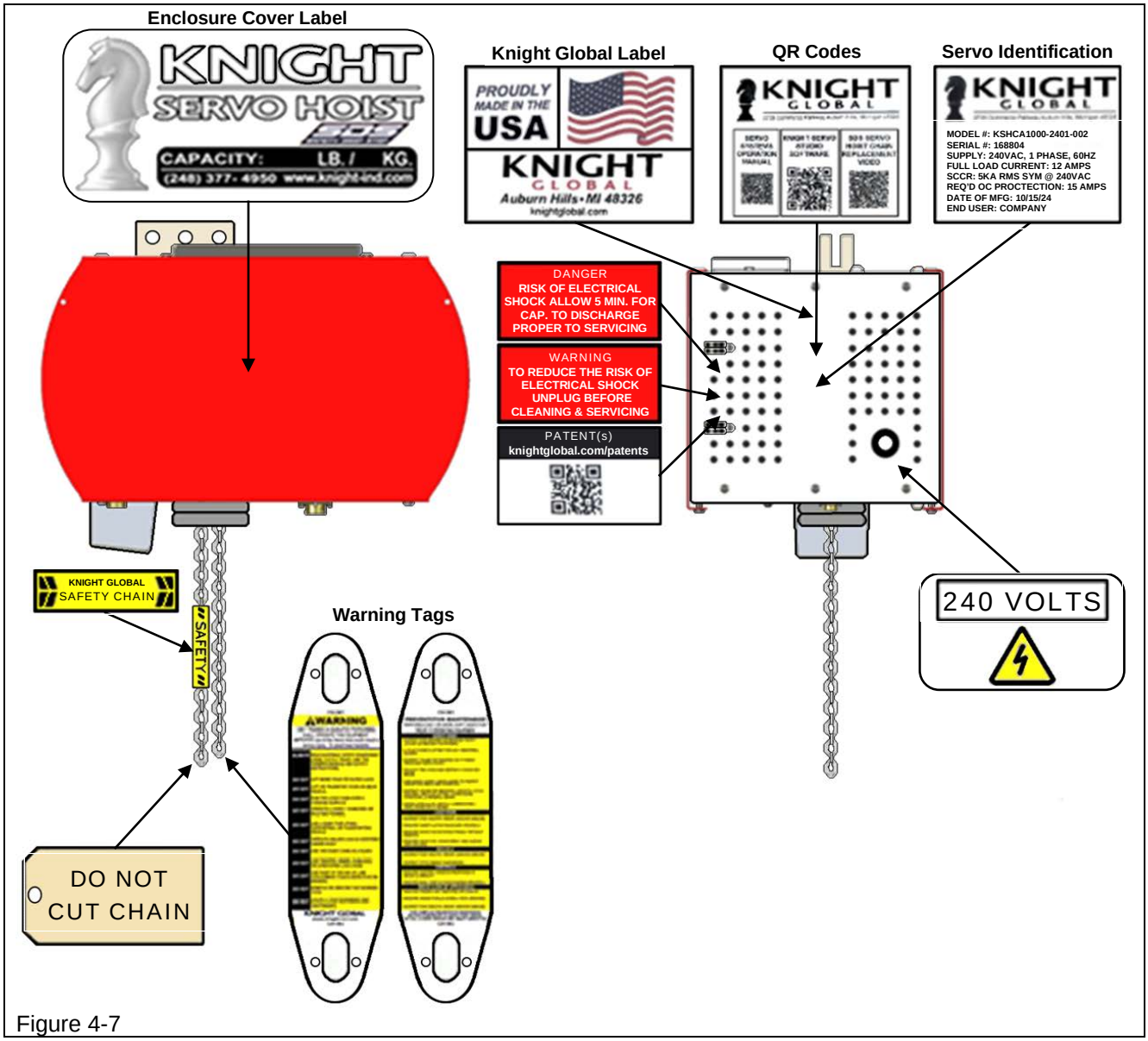


Figure 4-7

If any of the labels or warning tags listed above are missing, contact Knight Global at (248) 377-4950 x246 to order replacements.

4.6 Load and Safety Drop Stop Chain Replacement (Normal Maintenance)

The tools required to replace the chain are dependent on the type of chain being replaced.

- Servo Hoist with a **4mm** chain:
  - ✓ The Chain Bucket bolt requires a 5mm Hex key.
  - ✓ The Chain Nest bolt requires a 4mm Hex key.
  - ✓ The Chain Stop bolts requires a 4mm Hex key and a 10mm Wrench.
- Servo Hoist with a **5mm** chain:
  - ✓ The Chain Bucket bolt requires a 5mm Hex key.
  - ✓ The Chain Nest bolt requires a 4mm and 5mm Hex key.
  - ✓ The Chain Stop bolts requires a 5mm Hex key and a 10mm Wrench.
- Servo Hoist with a **7mm** chain:
  - ✓ The Chain Bucket bolt requires a 13mm Wrench.
  - ✓ The Chain Nest bolt requires a 4mm, 5mm and 6mm Hex key.
  - ✓ The Chain Stop bolts requires a 6mm Hex key and a 13mm Wrench.

The materials required for the chain replacement are shown in Figure 4-8:

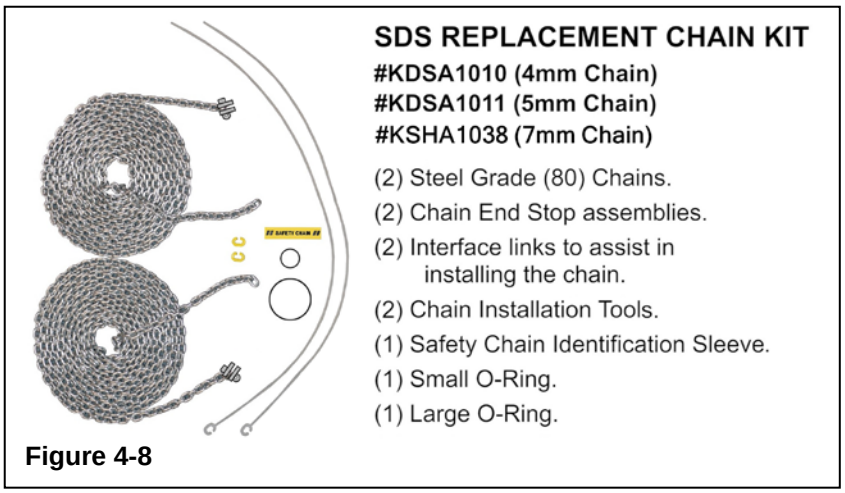


Figure 4-8

Step 1. Open the Knight Servo Studio (KSS) program and backup all of the parameters. See section 5.C. “Backing up the Knight Servo Hoist Software” for details.

Step 2. Raise the inline handle or Load Monitoring Module to its full up position.

Step 3. Measure the distance from the top of the inline handle or load cell assembly to the bottom of the servo hoist. (Refer to Figure 4-9)

Figure 4-9

Step 4. Record this measurement so it can be used in section 5.F. 'Encoder Offset Setup Procedure'.

Date of Replacement	Measurement
_____	_____ in.
_____	_____ in.
_____	_____ in.
_____	_____ in.
_____	_____ in.

Step 5. Move the inline handle or load cell assembly down to a comfortable working height.

Step 6. Remove ALL of the load that is attached to the hoist under the inline handle or load cell assembly. This includes the part and the system's fixture.

Step 7. Push the RUN-STOP button and the RED light will be illuminated.

Step 8. Remove both chains from the chain nest. The bottom bolt releases the Safety Drop Stop (SDS) chain and the top bolt releases the Load chain. (Refer to Figure 4-10)

NOTE: For the 7mm chain, the top and bottom bolts release the SDS chain. The middle bolt releases the Load chain.

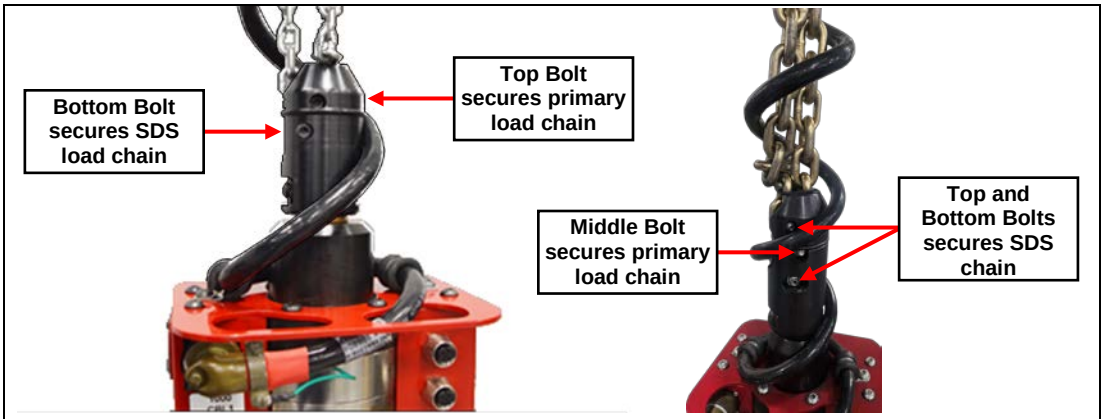


Figure 4-10 **[4 & 5mm Chain]** **[7mm Chain]**

Step 9. Remove the side covers from Servo Hoist. (Refer to Figure 4-11)

a. Remove the (2) two cover screws on the bottom of each of the covers.

b. Lift cover upwards off the pins.

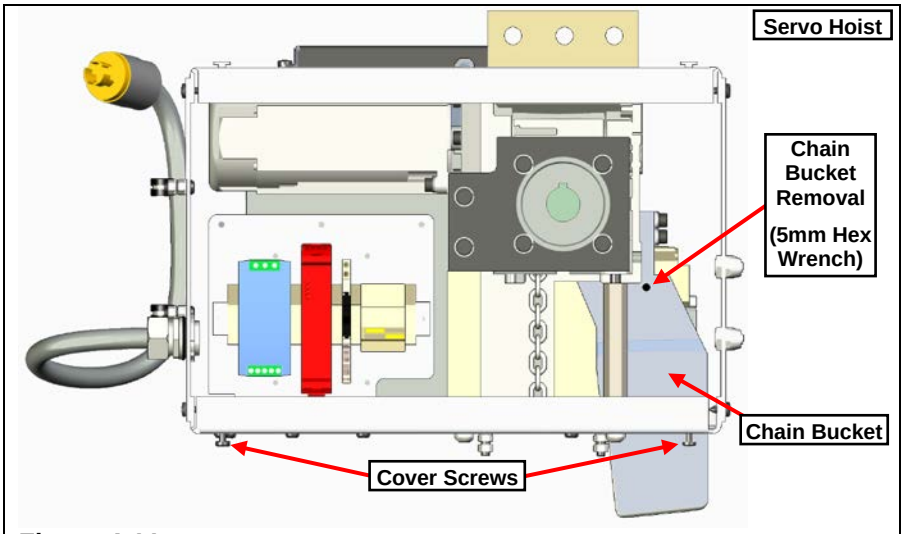


Figure 4-11

Step 10. While supporting the chain buckets, remove the (1) one retainer bolt that secures both chain buckets inside of the Servo Hoist. (Refer to Figure 4-12)

NOTE: For the 7mm chain, (4) bolts support the chain bucket.

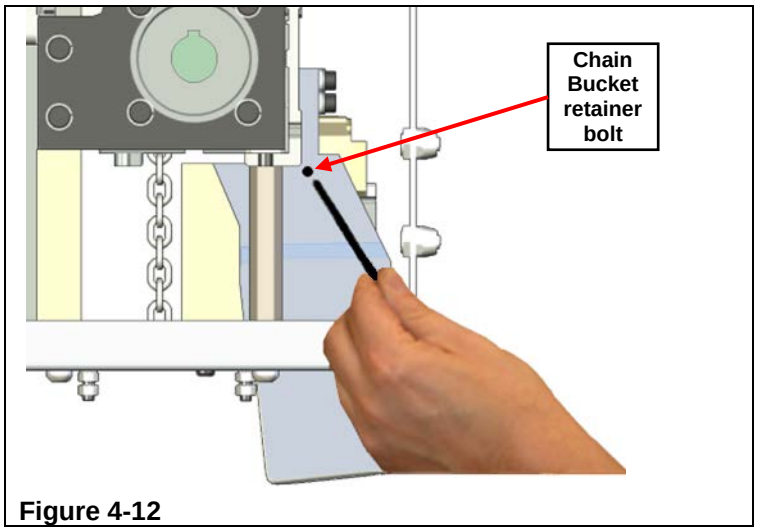


Figure 4-12

Step 11. Remove both chain buckets through the bottom of the Servo Hoist.

Step 12. Remove both chains from their individual chain buckets.

Step 13. Remove both end-stop assemblies from the each of the old load and Safety Drop Stop (SDS) chains.

Step 14. Connect both old chains together with both of the new replacement chains by using two of the yellow interface links provided in the kit. (Refer to Figure 4-13)

Figure 4-13 **[4 & 5mm Chain]** **[7mm Chain]**

Step 15. To enable the chain pay-out sequence, using the Operator Control Interface (OCI), twist the Run-Stop button clockwise to enable the hoist.
Within 3 seconds, press the Run-Stop button, press and release the Green Lift button and then the Blue Float button, twist the Run-Stop button clockwise and release. This will start the pay-out mode after three to ten seconds.
If the direction is incorrect, press the Run-Stop button to stop the pay-out mode and repeat the above sequence to pay-out the chain in the opposite direction.

Step 16. Stop the pay-out mode by pressing the Run-Stop button when the yellow interface chain links have moved through the gear box and are at an acceptable height to reattach the inline handle or load cell assembly.

Step 17. Reinstall both chains into each of their respective chain buckets and both end-stops to the ends of each chain.

Step 18. Lubricate both the load and the Safety Drop Stop (SDS) chains per section 4.4.3 'Chain Lubrication'.

Step 19. Reinstall the chain buckets back into the servo hoist.

Step 20. Reinstall the servo hoist side covers.

Step 21. The SDS chain needs to be cut to the correct length so it has slack in it when the load chain is properly connected.

Step 22. Ensure that both chains are parallel with no twists from the gear box down to their respective ends.

Step 23. Count down seven links from the end of the load chain. Cut the **seventh link** so the SDS chain is six links longer than the load chain. (Refer to Figure 4-14)
NOTE: For the 7mm chain, the **fifth link** is cut.

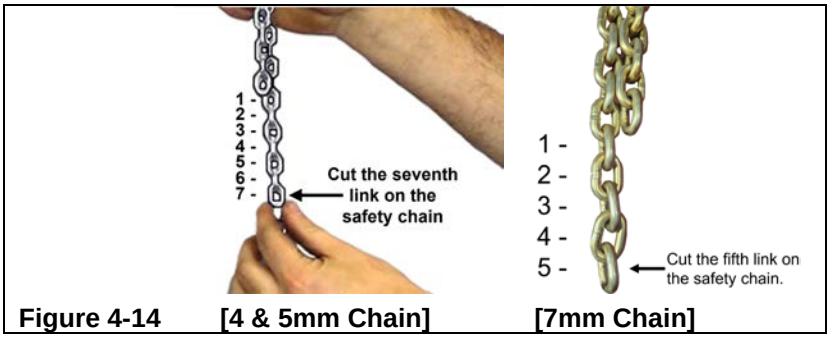


Figure 4-14 **[4 & 5mm Chain]** **[7mm Chain]**

Step 24. Install the safety chain identification sleeve on the SDS chain and then heat shrink it to the SDS chain on the eighth link up from the bottom of the SDS chain. (Refer to Figure 4-15)

Figure 4-15

Step 25. Reinstall the new small O-ring around both the load and SDS chains.

Step 26. Reinstall both chains back through the center of the coil cable.

Step 27. Ensure that both chains are parallel to each other and have NO twists in them when they are installed into the chain nest. (Refer to Figure 4-16)

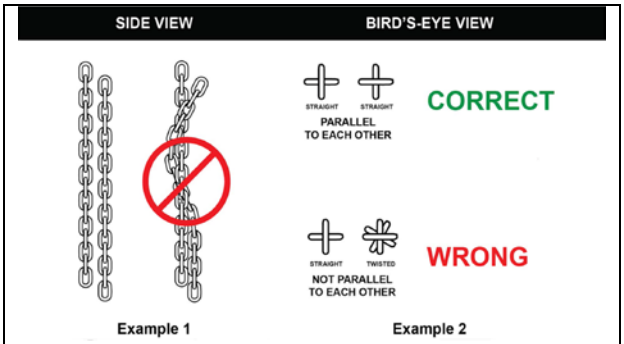


Figure 4-16

Step 28. First, the last link of the load chain is installed into the top slot of the chain nest. The chain must be kept parallel with no twists. The bolt is installed in front of the last link of the load chain and into the chain nest. (Refer to Figure 4-17)

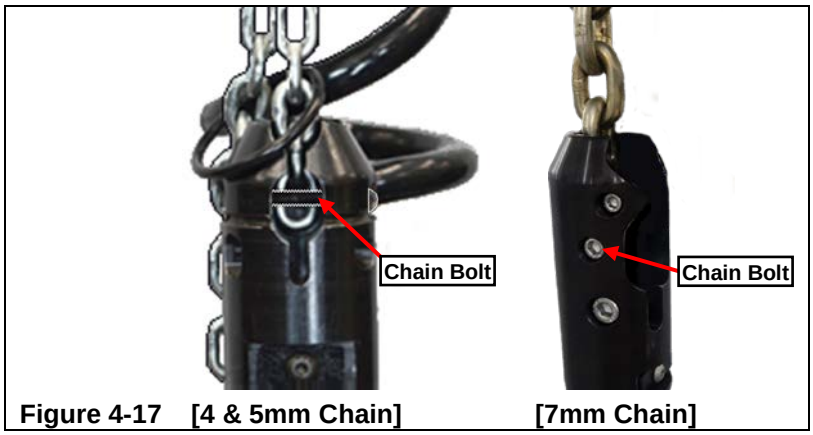


Figure 4-17 [4 & 5mm Chain] [7mm Chain]

Step 29. Next, the last link of the SDS chain is installed into the bottom slot of the chain nest. The chain must be kept parallel with no twists. The bolt is installed through the last link of the SDS and into the chain nest. (Refer to Figure 4-18)
NOTE: For the 7mm chain, the top and bottom bolts are installed through the links.

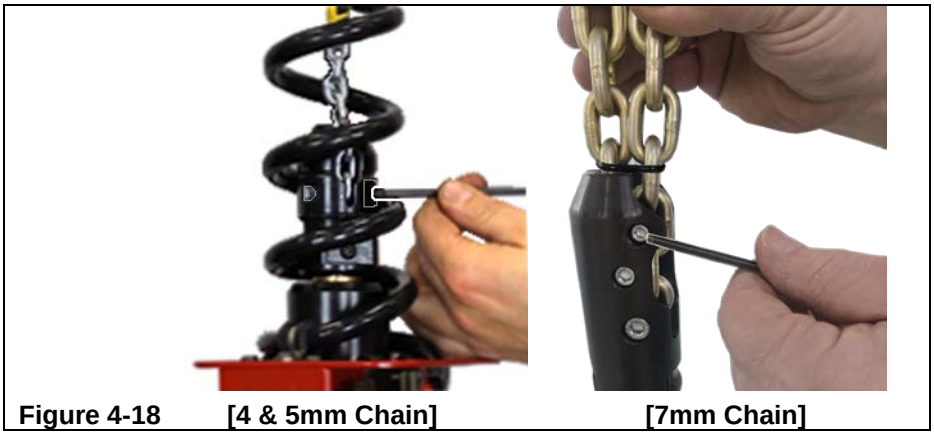


Figure 4-18 [4 & 5mm Chain] [7mm Chain]

WARNING

The SDS and Load chains must NOT have any twists in them from the bottom of the servo to the chain nest.

Step 30. Reinstall the large O-ring into the groove located on the chain nest. (Refer to Figure 4-17)

Step 31. Move the small O-ring down so it is just above the top of the chain nest.

Step 32. Twist the Run-Stop button ¼ turn to the right and the servo hoist will re-enable.

4.6.1 Resetting the Encoder Offset

Please refer to section 5.F. 'Encoder Offset Setup Procedure' for the steps to reset the encoder offset for this system.

WARNING

Do NOT raise the servo handle above the recorded measurement obtained in Step 3 of section 4.6 'Load and Safety Drop Stop Chain Replacement (Normal Maintenance)' or damage may be done to the coil cable.

NOTE

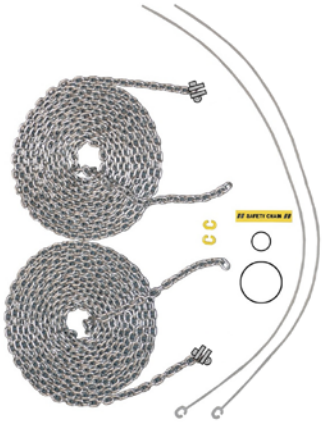
SDS Servo Hoist Chain Replacement Video

4.7 Broken Chain Replacement

The tools required to replace the chain are dependent on the type of chain being replaced.

- Servo Hoist with a **4mm** chain:
  - ✓ The Chain Bucket bolt requires a 5mm Hex key.
  - ✓ The Chain Nest bolt requires a 4mm Hex key.
  - ✓ The Chain Stop bolts requires a 4mm Hex key and a 10mm Wrench.
- Servo Hoist with a **5mm** chain:
  - ✓ The Chain Bucket bolt requires a 5mm Hex key.
  - ✓ The Chain Nest bolt requires a 4mm and 5mm Hex key.
  - ✓ The Chain Stop bolts requires a 5mm Hex key and a 10mm Wrench.
- Servo Hoist with a **7mm** chain:
  - ✓ The Chain Bucket bolt requires a 13mm Wrench.
  - ✓ The Chain Nest bolt requires a 4mm, 5mm and 6mm Hex key.
  - ✓ The Chain Stop bolts requires a 6mm Hex key and a 13mm Wrench.

The materials required for the chain replacement are shown in Figure 4-19:



SDS REPLACEMENT CHAIN KIT

#KDSA1010 (4mm Chain)
#KDSA1011 (5mm Chain)
#KSHA1038 (7mm Chain)

(2) Steel Grade (80) Chains.
(2) Chain End Stop assemblies.
(2) Interface links to assist in installing the chain.
(2) Chain Installation Tools.
(1) Safety Chain Identification Sleeve.
(1) Small O-Ring.
(1) Large O-Ring.

Figure 4-19

Step 1. Open the Knight Servo Studio (KSS) program and backup all of the parameters. See section 5.C. “Backing up the Knight Servo Hoist Software” for details.

Step 2. Raise the inline handle or Load Monitoring Module to its full up position.

Step 3. Measure the distance from the top of the inline handle or load cell assembly to the bottom of the servo hoist. (Refer to Figure 4-20)

Figure 4-20

Step 4. Record this measurement so it can be used in section 5.F. 'Encoder Offset Setup Procedure'.

Date of Replacement	Measurement
_____	_____ in.
_____	_____ in.
_____	_____ in.
_____	_____ in.
_____	_____ in.

Step 5. Move the inline handle or load cell assembly down to a comfortable working height.

Step 6. Remove ALL of the load that is attached to the hoist under the inline handle or load cell assembly. This includes the part and the system's fixture.

Step 7. Push the RUN-STOP button and the RED light will be illuminated.

Step 8. Remove both chains from the chain nest. The bottom bolt releases the Safety Drop Stop (SDS) chain and the top bolt releases the Load chain. (Refer to Figure 4-21)

NOTE: For the 7mm chain, the top and bottom bolts release the SDS chain. The middle bolt releases the Load chain.

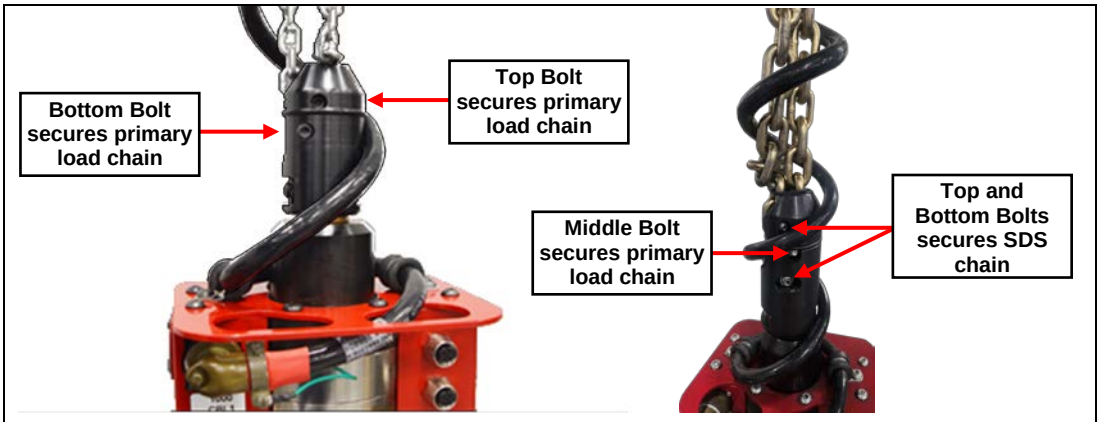


Figure 4-21 **[4 & 5mm Chain]** **[7mm Chain]**

Step 9. Remove the side covers from Servo Hoist. (Refer to Figure 4-22)
a. Remove the (2) two cover screws on the bottom of each of the covers.
b. Lift cover upwards off the pins.

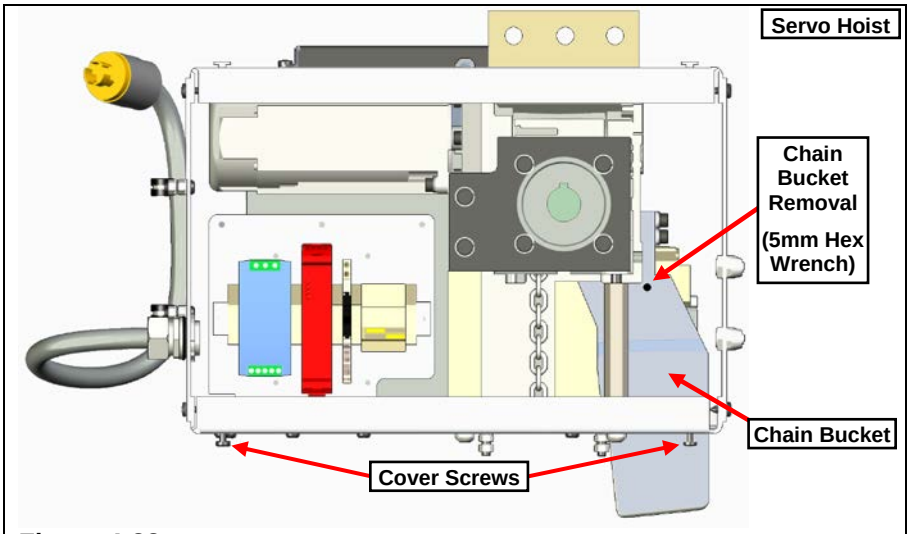


Figure 4-22

Step 10. While supporting the chain buckets, remove the (1) one retainer bolt that secures both chain buckets inside of the Servo Hoist. (Refer to Figure 4-23)
NOTE: For the 7mm chain, (4) bolts support the chain bucket.

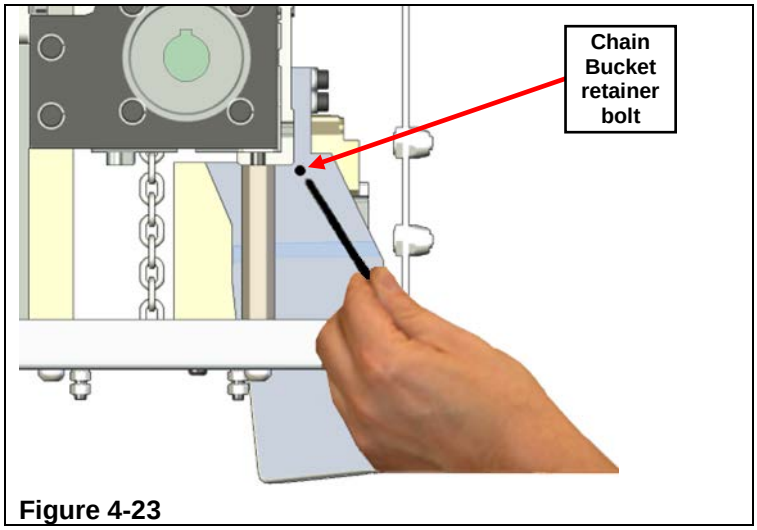


Figure 4-23

Step 11. Remove the chain buckets through the bottom of the Servo Hoist.

Step 12. Remove both chains from the individual chain buckets.

Step 13. Remove both end-stop assemblies from the each of the old load and Safety Drop Stop (SDS) chains.

Step 14. Connect the old SDS chain to the new SDS chain using one of the yellow interface links. (Refer to Figure 4-24)

Figure 4-24 **[4 & 5mm Chain]** **[7mm Chain]**

Step 15. To enable the chain pay-out sequence, using the Operator Control Interface (OCI), twist the Run-Stop button clockwise to enable the hoist.
Within 3 seconds, press the Run-Stop button, press and release the Green Lift button and then the Blue Float button, twist the Run-Stop button clockwise and release. This will start the pay-out mode after three to ten seconds.
If the direction is incorrect, press the Run-Stop button to stop the pay-out mode and repeat the above sequence to pay-out the chain in the opposite direction.

Step 16. When the yellow chain interface link reaches the gear box, stop the pay-out mode by pressing the Run-Stop button.

Step 17. Using the chain installation tool, locate the load chain pocket opening on the bottom of the gear box. (Refer to Figure 4-25)

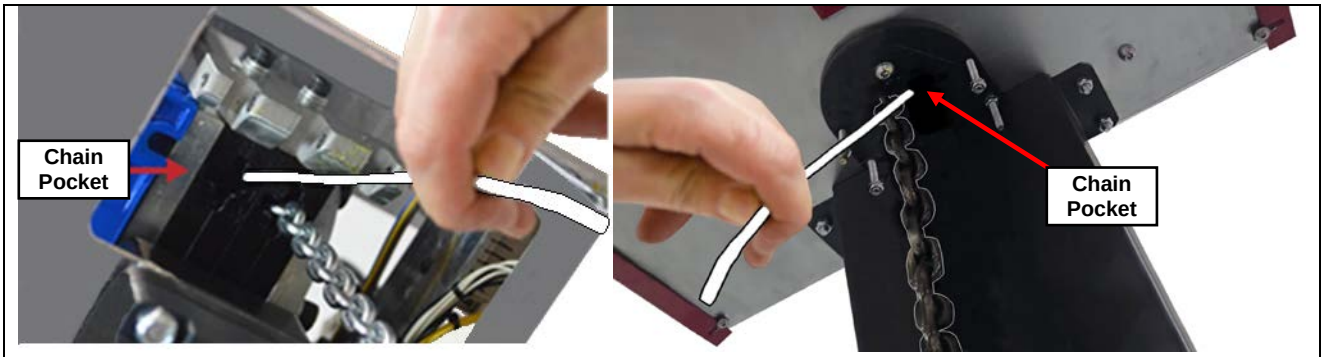


Figure 4-25 **[4 & 5mm Chain]** **[7mm Chain]**

Step 18. Using the chain installation tool, feed it completely through the gear box.

Step 19. Connect the new load chain to the chain installation tool.

Step 20. Pull the chain installation tool until the load chain just enters the gear box chain pocket opening.

Step 21. Ensure that the new load chain is aligned correctly so that it will enter the gear box properly.

Step 22. Ensure that there is tension on the chain replacement tool so that it is pulled into the gear box when the payout mode is started.

Step 23. Restart the pay-out mode by following the procedure listed in Step 15 above.

Step 24. This will feed the new load chain and SDS chain through the gear box.

Step 25. When the new load chain is long enough to attach to the chain nest, press the Run-Stop button to stop the pay-out mode.

Step 26. Reinstall both chains into each of their respective chain buckets and both end-stops to the ends of each chain.

Step 27. Lubricate both the load and the Safety Drop Stop (SDS) chains per section 4.4.3 'Chain Lubrication'.

Step 28. Reinstall both chains into each of their correct chain buckets.

Step 29. Reinstall the chain buckets back into the servo hoist.

Step 30. Reinstall the servo hoist side covers.

Step 31. The SDS chain needs to be cut to the correct length so it has slack in it when the load chain is properly connected.

Step 32. Ensure that both chains are parallel with no twists from the gear box down to their respective ends.

Step 33. Count down seven links from the end of the load chain. Cut the **seventh link** so the SDS chain is six links longer than the load chain. (Refer to Figure 4-26)
NOTE: For the 7mm chain, the **fifth link** is cut.

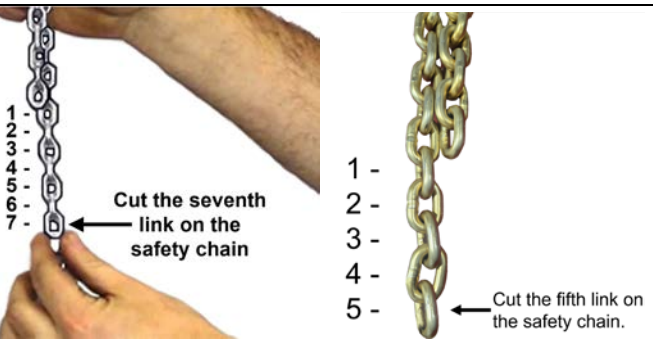


Figure 4-26 **[4 & 5mm Chain]** **[7mm Chain]**

Step 34. Install the safety chain identification sleeve on the SDS chain and then heat shrink it to the SDS chain on the eighth link up from the bottom of the SDS chain. (Refer to Figure 4-27)

Figure 4-27

Step 35. Reinstall the new small O-ring around both the load and SDS chains.

Step 36. Reinstall both chains back through the center of the coil cable.

Step 37. Ensure that both chains are parallel to each other and have NO twists in them when they are installed into the chain nest. (Refer to Figure 4-28)

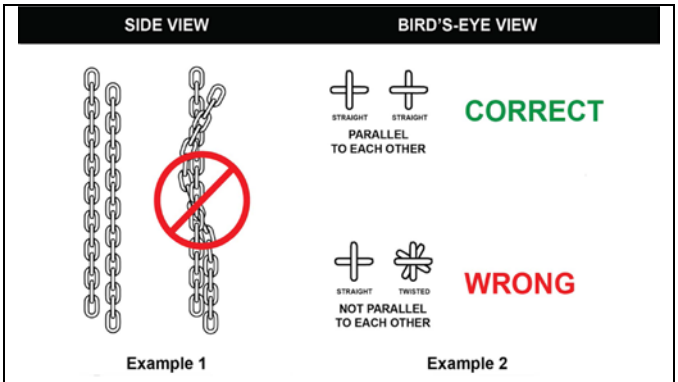


Figure 4-28

Step 38. First, the last link of the load chain is installed into the top slot of the chain nest. The chain must be kept parallel with no twists. The bolt is installed <u>in front of</u> the last link of the load chain and into the chain nest. (Refer to Figure 4-29)

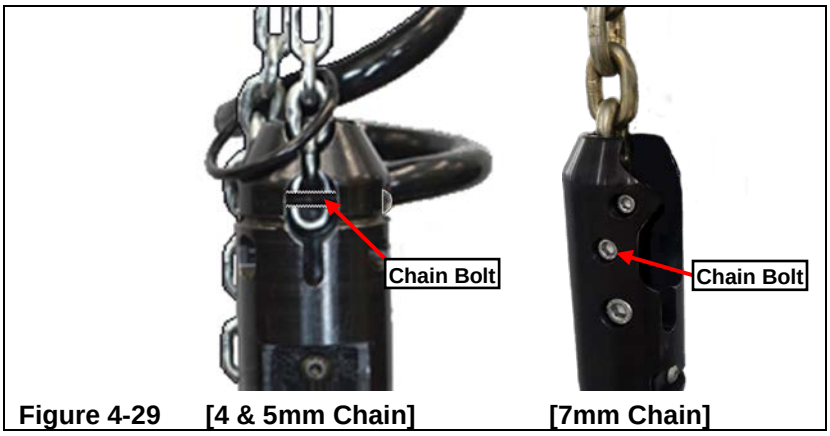


Figure 4-29 [4 & 5mm Chain] [7mm Chain]

Step 39. Next, the last link of the SDS chain is installed into the bottom slot of the chain nest. The chain must be kept parallel with no twists. The bolt is installed through the last link of the SDS and into the chain nest. (Refer to Figure 4-30)

NOTE: For the 7mm chain, the top and bottom bolts are installed through the links.

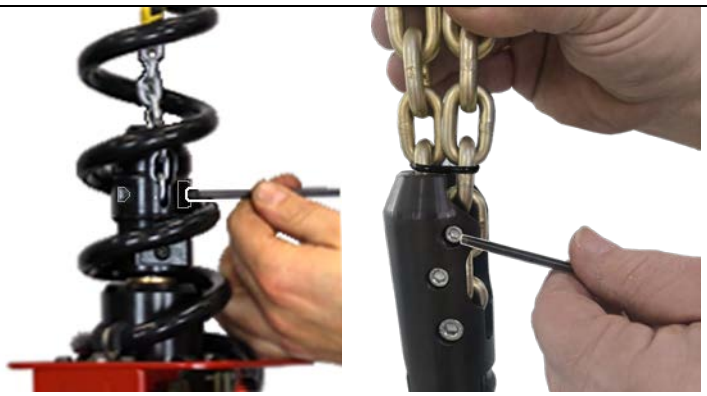


Figure 4-30 [4 & 5mm Chain] [7mm Chain]

WARNING

The SDS and Load chains must NOT have any twists in them from the bottom of the servo to the chain nest.

Step 39. Reinstall the large O-ring into the groove located on the chain nest. (Refer to Figure 4-29)

Step 40. Move the small O-ring down so it is just above the top of the chain nest.

Step 41. Twist the Run-Stop button ¼ turn to the right and the servo hoist will re-enable.

4.7.1 Resetting the Encoder Offset

Please refer to section 5.F. 'Encoder Offset Setup Procedure' for the steps to reset the encoder offset for this system.

WARNING

Do NOT raise the servo handle above the recorded measurement obtained in Step 3 of section 4.7 'Broken Chain Replacement' or damage may be done to the coil cable.

5. SOFTWARE

There are several subjects related to the Servo Hoist's software that will be reviewed here:

5.A.) Getting Started
5.B.) Connecting to a Servo Hoist
5.C.) Backing up the Parameters from the Knight Servo Studio Software
5.D.) Backing up the Entire Knight Servo Hoist Software
5.E.) Restoring a .KSA backup: Knight Servo Studio Software and Firmware
5.F.) Review the software's firmware and the servo's Hardware compatibility
5.G.) Load a New Drive with Existing Software
5.H.) Check or Change Setup Values
5.I.) Encoder Offset Setup Procedure
5.J.) Operating Chain Payout Mode
5.K.) Accessing the Servo Hoist's Fault Log

In the next few sections of the manual a shorthand is used to point to a particular screen in the Knight Servo Studio (KSS) program. The shorthand that explains how to find each screen or parameter in the KSS is explained below:

KSS Workspace tree location: Knight Work Order # \ Status \ System Status Bits
This means that in the 'Workspace' panel on the left-hand side of the screen, the '+' sign next to the Knight Work Order number needs to be pressed. This will expand the selection tree. Mouse down and press the '+' sign next to the 'Status' option and double-click on the 'System Status Bits' screen. This will open that screen and any specific parameters can be inspected.

KSS Home screen location: Quick View panel \ Row 6 (Lower right-hand portion of the screen)
This means that on the Knight Servo Studio's home screen there is a panel located in the lower right-hand portion of the screen labeled 'Quick View'. The parameter in question is located on 'Row 6' of that panel.

If the Servo Hoist is being set up for the first-time, here is a list of functions to initially verify. The functions can be accessed from the Setup screens located here:
KSS Workspace tree location: Knight Work Order # \ Setup

1) The hoist's maximum allowed weight: This can be verified by following the instructions in section 5.E. 'Check or Change Setup Values' or by opening the 'WEIGHTS LIMITS' screen.
2) The hoist's minimum weight: This can be verified by following the instructions in section 5.H. 'Check or Change Setup Values' or by opening the 'WEIGHTS LIMITS' screen.
3) The hoist's fixture weight is correct: This can be verified by following the instructions in section 5.H. 'Check or Change Setup Values' or by opening the 'WEIGHTS LIMITS' screen.
4) The analog handle is balanced: This can be verified by following the instructions in section 5.H. 'Check or Change Setup Values' or by opening the 'ANALOG HANDLE CALIBRATION' screen.
5) The encoder offset procedure: This can be verified by following the instructions in section 5.I. 'Encoder Offset Setup Procedure' or by opening the 'POSITION CALIBRATION' screen.

A. Getting Started

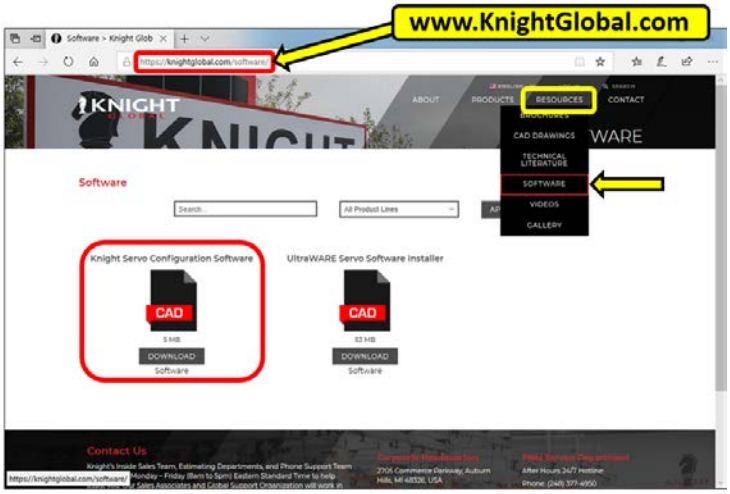
Listed below are the hardware and software items needed to connect to a Knight Servo Hoist:
(Refer to Figure 5-1)

- Laptop running Microsoft Windows 7 or above. (Customer Supplied)
- Ethernet Cable with (1) RJ45 connector and (1) M12 4-pin connector.
- The Knight Servo Studio software package. This can be obtained by:

1. Ordering it from Knight with Ethernet Cable: P/N KCA1052.

Figure 5-1

2. Downloading it from Knight's website at:
   a. https://knightglobal.com/software/
      Click on the "Knight Servo Configuration Software" selection and download it.
   b. Use the QR code to download the Knight Servo Studio software. (Refer to Figure 5-2)



Knight Servo Studio Software Download Site

Figure 5-2

3. Downloading it from the Servo Drive.
   Log onto the Servo Drive and bring up any web browser.
   Type in the network address: 192.168.2.101
   Mouse over to the "Downloads" TAB and select the top option:
   "Knight Servo Configuration Software Installer.msi". (Refer to Figure 5-3)

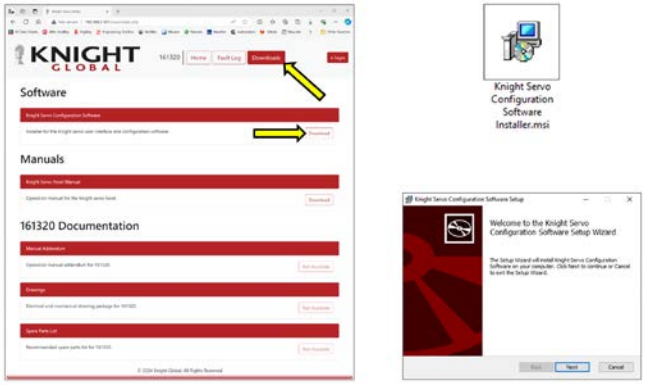


Figure 5-3

B. Connecting to a Servo Hoist

The Knight Servo Studio Servo software is used to configure and troubleshoot the Knight Servo Hoist. The following steps are required to initiate a connection between a computer running the Knight Servo Studio software and the Knight Servo Hoist:

Knight Servo Studio Software Package Setup:

Step 1. Setup the Ethernet communication settings for your laptop.

a. Using a Microsoft Windows based PC open the **Network and Sharing Center**.
b. Right click on **Local Area Connections**. Select **Properties**. (Refer to Figure 5-4)

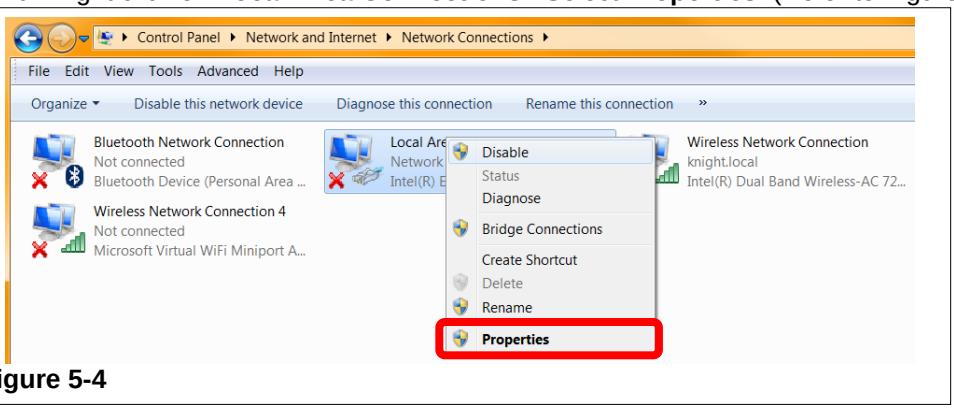


Figure 5-4

c. Select **Internet Protocol Version 4 (TCP/IPv4)**. Select **Properties**.
d. Select **Use the following IP address:**

In most cases the laptop's IP Address should be: 192.168.2.250
Type the correct IP address and Subnet mask into the spaces provided and press the 'OK' button. (Refer to Figure 5-5)

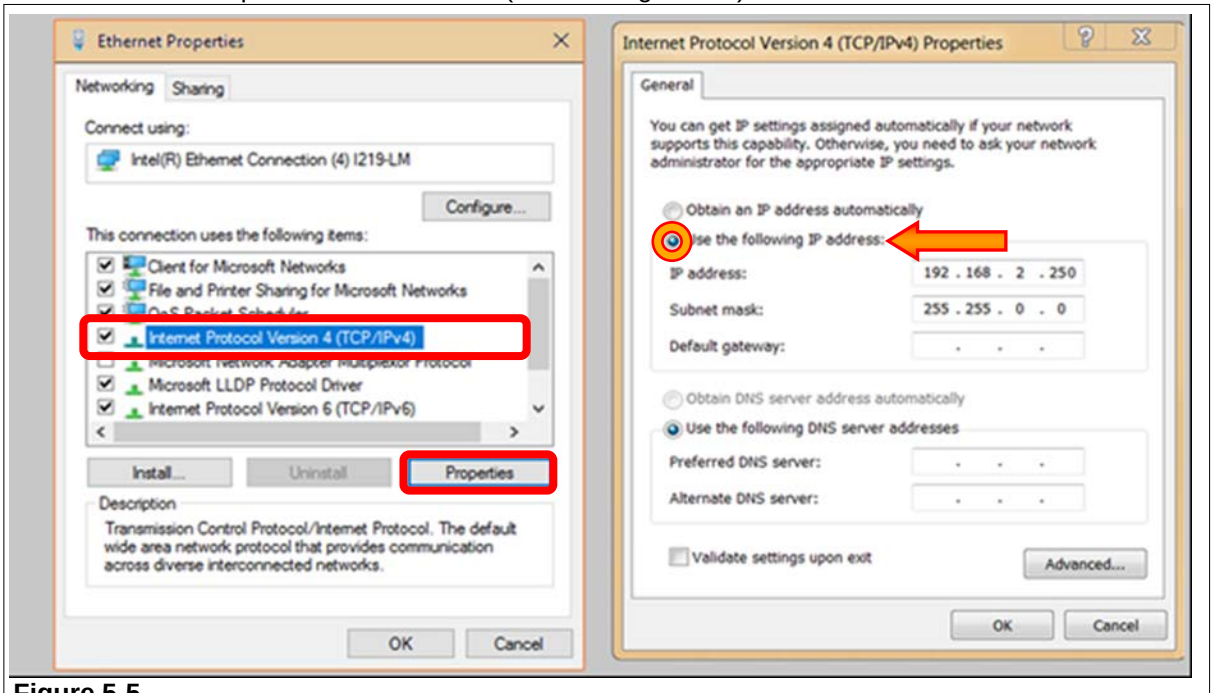


Figure 5-5

Step 2. Insert the USB card that was supplied with Servo Hoist into the laptop.

Double-click on the “ksh_sm_user.exe” icon to launch the Knight Servo Studio installation software. (Refer to Figure 5-6)

Complete the installation process.

Figure 5-6

Step 3. Double click on the blue Knight Servo Studio software icon located on the desktop and allow the Knight Servo Studio software to load. (Refer to Figure 5-7)

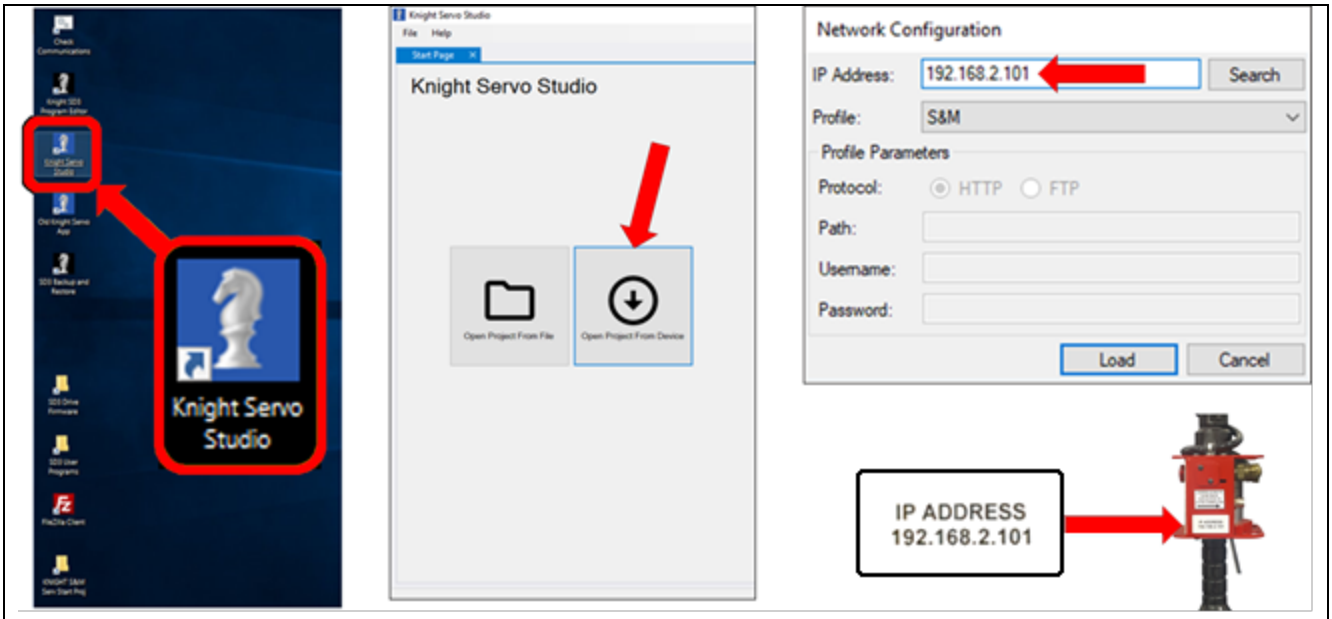


Figure 5-7

Step 4. When the software loads, choose the ‘Open Project from Device’ option.
Input the correct IP Address into the Network Configuration box.
The IP Address for the hoist will be located next to the M12 ENET receptacle located on the Load Monitoring Module or the Inline Handle, but in most cases is: 192.168.2.101
(Refer to Figure 5-7)

Step 5. Move the mouse to the right side of the screen and select the ‘Connect’ button.
If the communications are operating correctly the red ‘Disconnected’ box will turn to a green ‘Connected’ box. (Refer to Figure 5-8)

If the Knight Servo Studio software does not connect to the hoist, recheck all of the connections and ensure that the hoist has its 240VAC power connected.

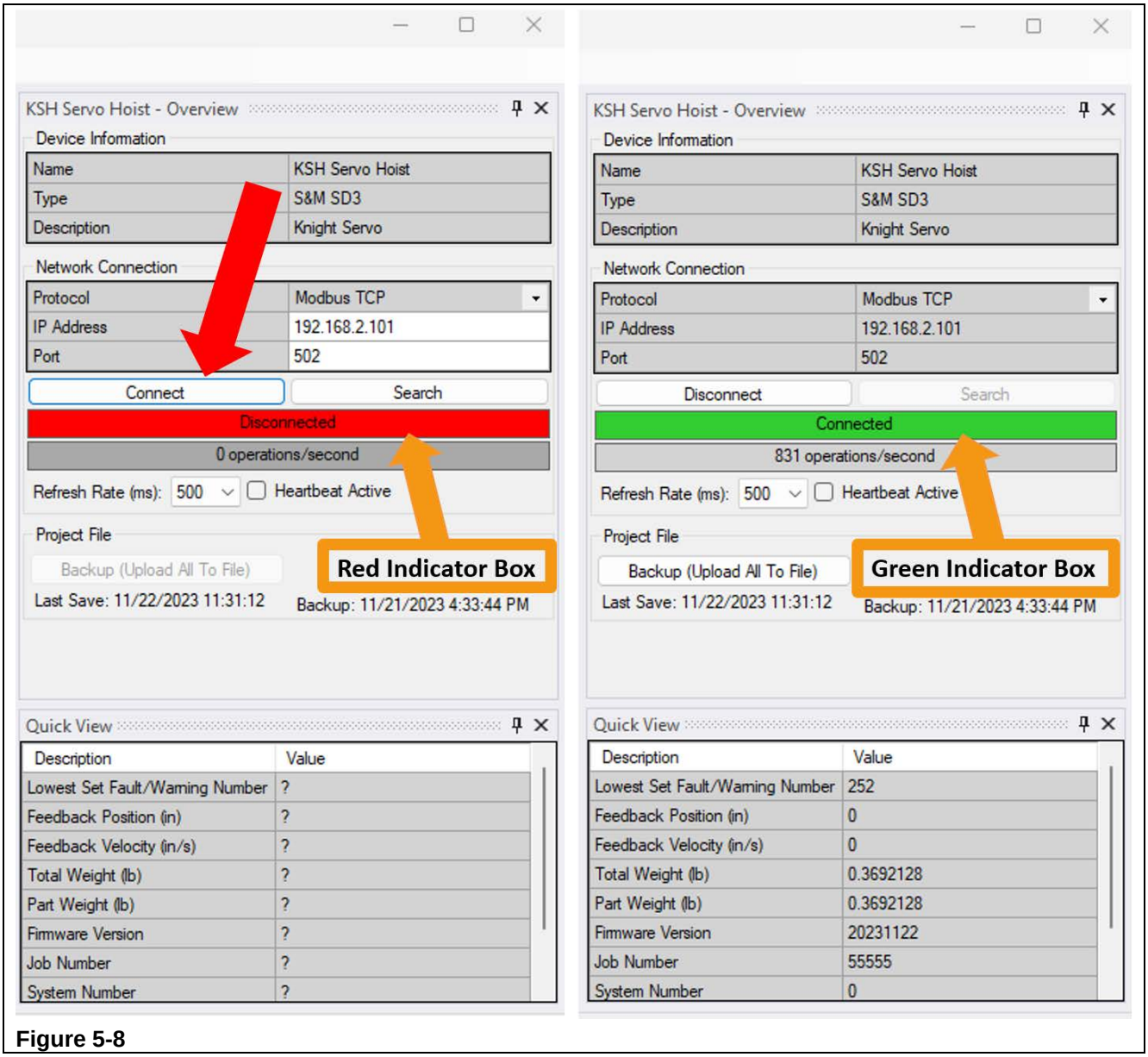


Figure 5-8

C. Backing up the Parameters from the Knight Servo Studio Software

The section will explain how to save the parameters found in the 'Knight Servo Studio' program (a .KSP file). Ensure you are connected to the servo hoist.

Save the parameters found in the Knight Servo Studio's .KSP file:

Step 1. Move the mouse to the left side of the screen and select the 'File' dropdown. Move down to 'Save to File' and select this function (Refer to Figure 5-9)

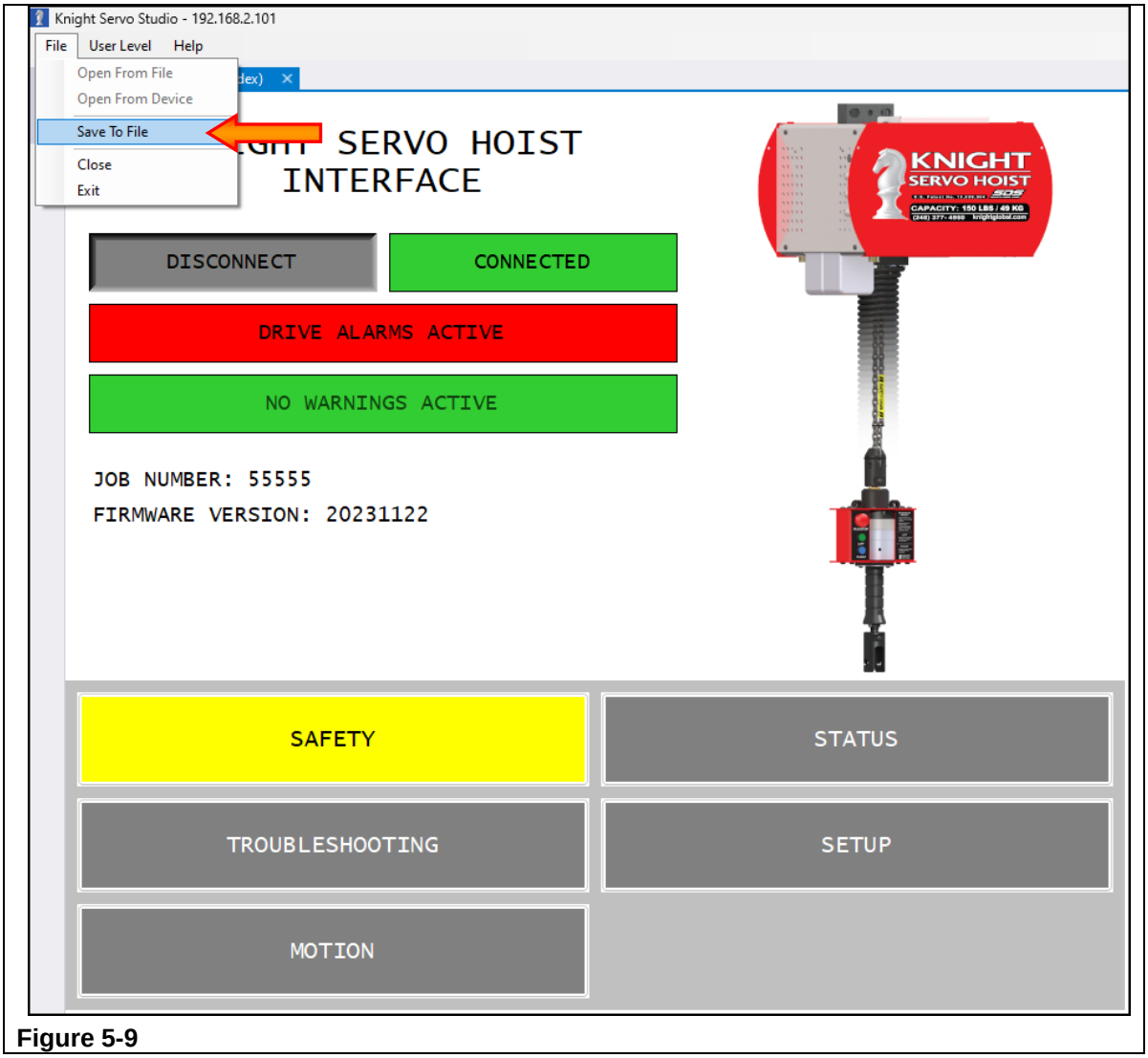


Figure 5-9

Step 2. Pick the filename and the location where the .KSP backup will be saved.

Step 3. When the progress bar has completed, located on the right side of the screen, the parameter backup is done.

D. Backing up the Entire Knight Servo Hoist Software

The section will explain how to save a backup copy of the 'Knight Servo Studio' program (a .KSA file).

Save a copy of the Knight Servo Studio's .KSA file:

Step 1. Start the "SD3 Backup and Restore" program by Double-Clicking on the correct Icon. (Refer to Figure 5-10)

Figure 5-10

Step 2. Select the correct 'Network Interface' for your laptop. This may vary depending on your laptop's hardware configuration and may vary each time hardware is added to your laptop.

If the 'Local Interface' settings are correct, the values will show up as GREEN. (Refer to Figure 5-11)

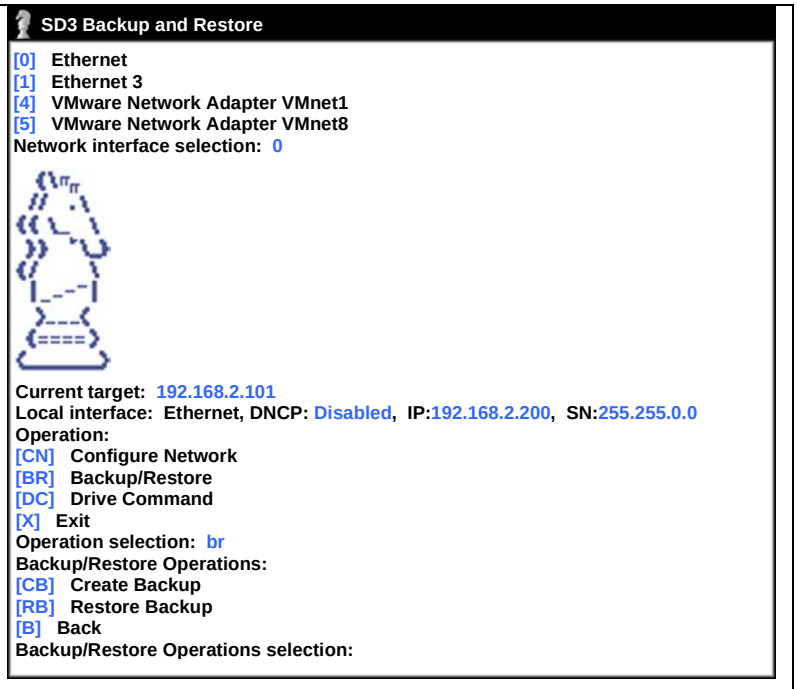


Figure 5-11

Step 3. Type in ‘br’ into the ‘Operation selection’ to initiate the ‘Backup/Restore’ function.
Type in ‘cb’ in the ‘Backup/Restore Operation selection’ to initiate the ‘Create Backup’ function.
(Refer to Figure 5-12)

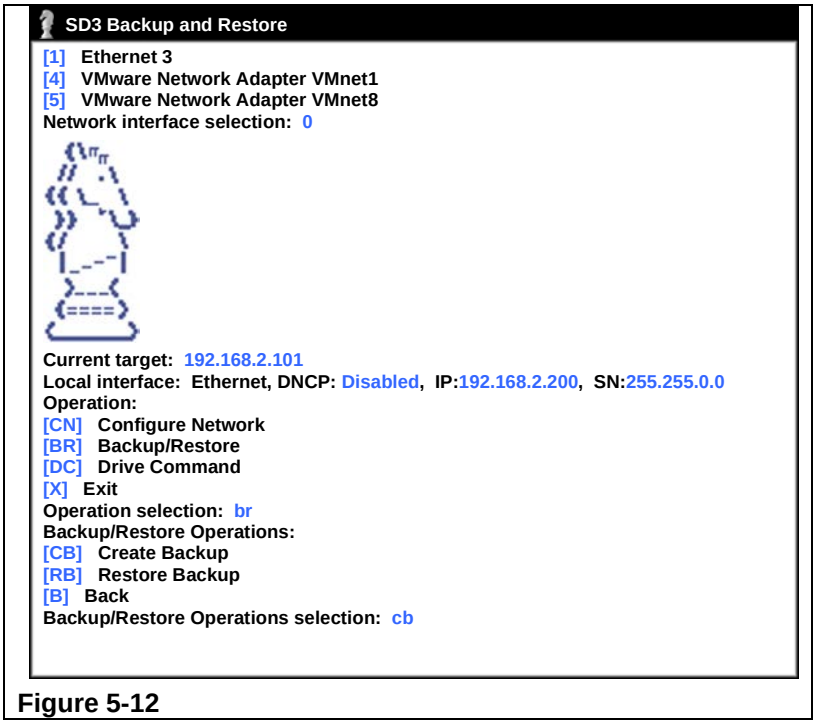


Figure 5-12

Step 4. Press the “Enter” button to allow the program to store the backup file on your laptop’s Desktop.
(Refer to Figure 5-13)

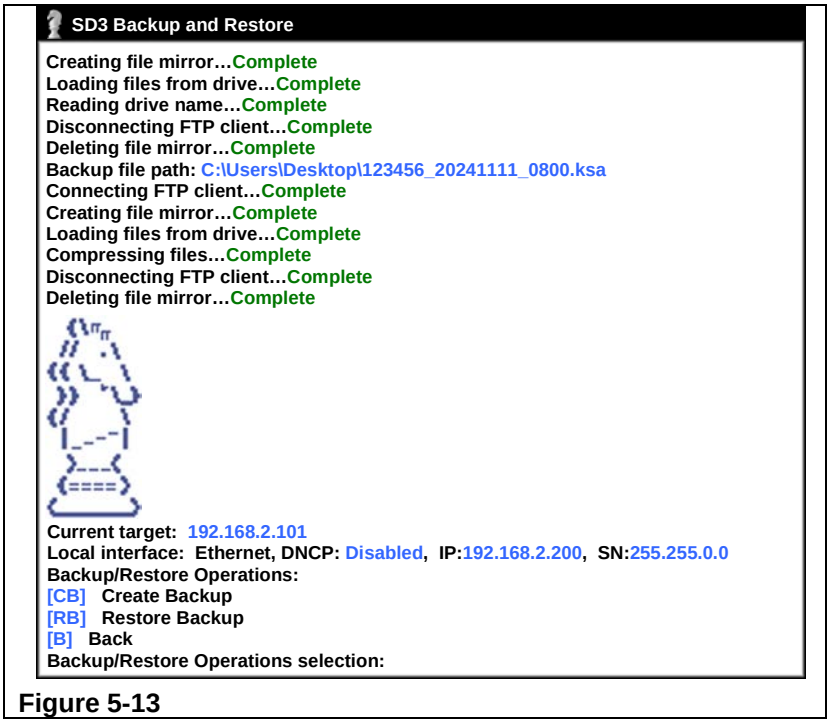


Figure 5-13

Step 5. When the backup procedure is complete, mouse to your Desktop and copy the backup file into an email.
Send a copy of the newly saved file to Knight's Servo Team at servos@knightglobal.com (Refer to Figure 5-14)

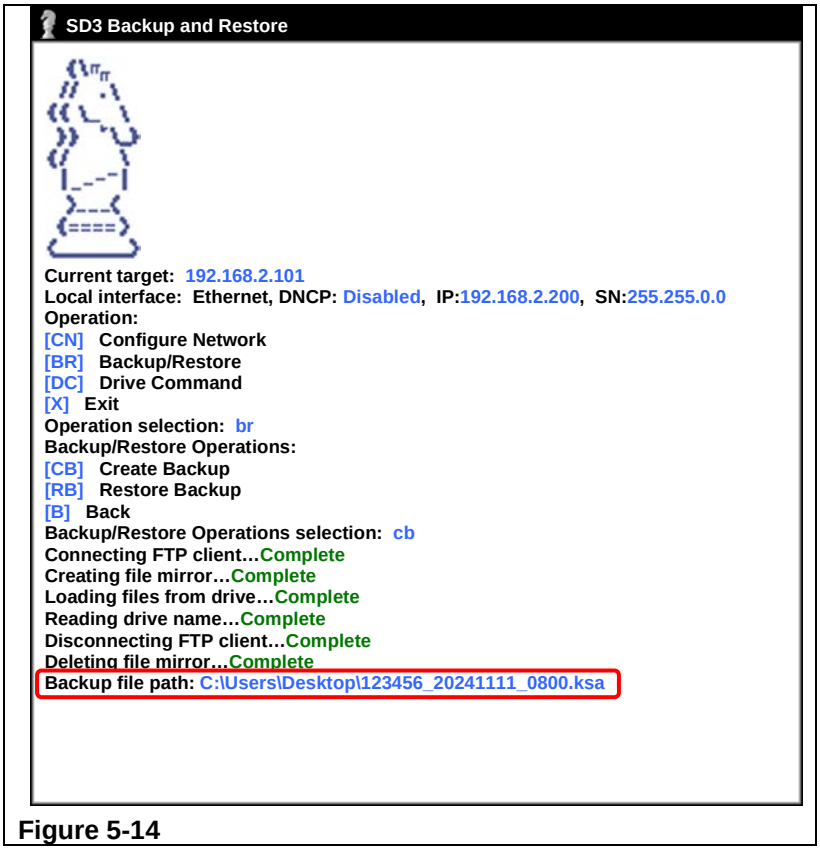


Figure 5-14

E. Restoring a .KSA backup: Knight Servo Studio Software and Firmware

The section will explain how to restore an entire copy of the 'Knight Servo Studio' program (a .KSA file).

Upload a copy of the Knight Servo Studio's using a .KSA file:

Step 1. Start the "SD3 Backup and Restore" program by Double-Clicking on the correct Icon. (Refer to Figure 5-15)

Figure 5-15

Step 2. Select the correct 'Network Interface' for your laptop. This may vary depending on your laptop's hardware configuration and may vary each time hardware is added to your laptop.

The system will display the IP Address of servo that the .KSA will be uploaded to. (Refer to Figure 5-16)

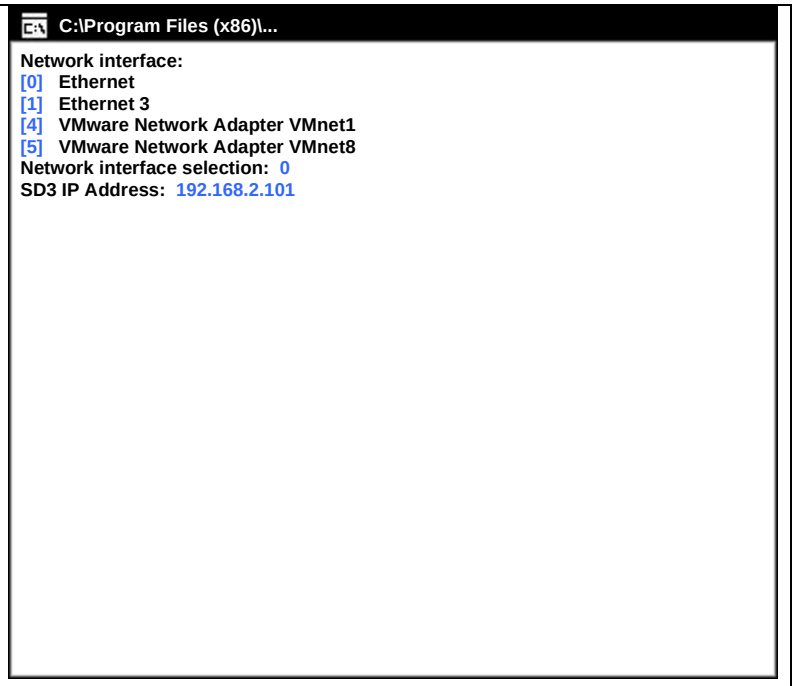


Figure 5-16

Step 3. The program will ask if you want to Create a Backup.
Type in a “Y” and an entire system backup will be created.
The program will generate a backup path.
Press the “Enter” button to save the backup on your desktop. (Refer to Figure 5-17)

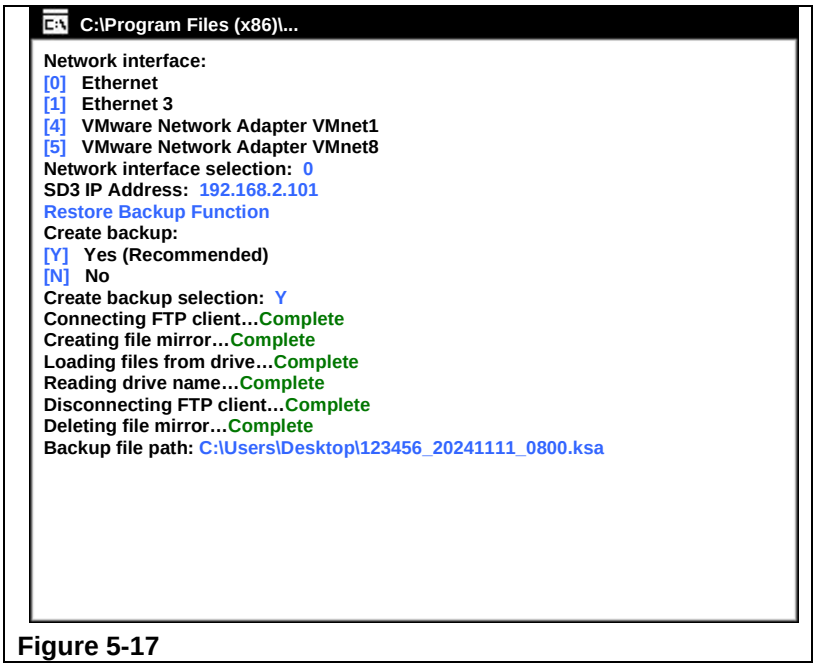


Figure 5-17

Step 4. The program will inform you what will be uploaded to the servo:

a. Full system backup. This will replace the entire software package.
b. Partial system backup. This will only replace certain portions of the software.

Type in a “Y” and the program will upload the backup to the servo.
(Refer to Figure 5-18)

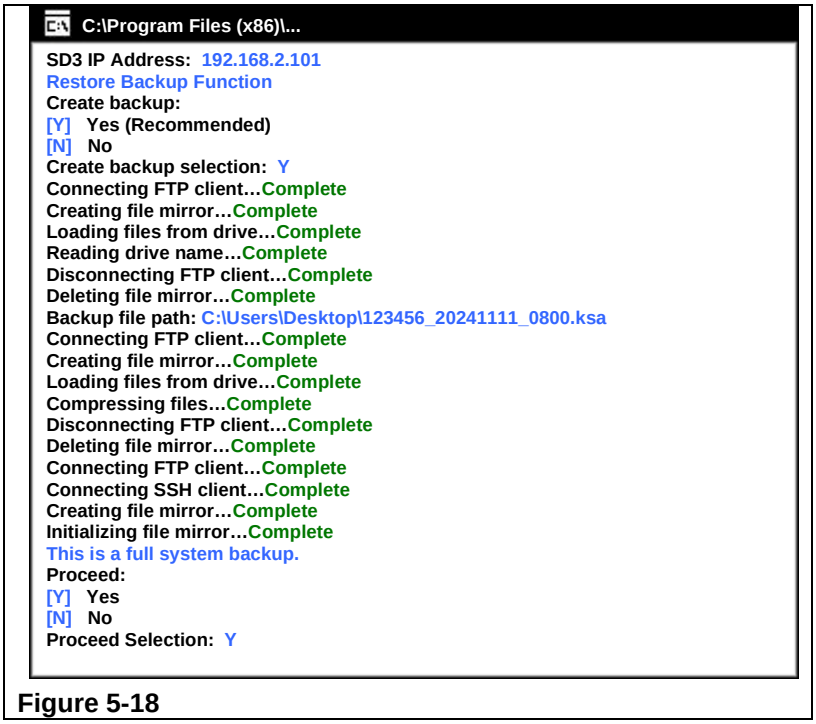


Figure 5-18

Step 5. When the upload procedure is complete, test the system and ensure that it functions correctly. If you have any questions, please contact your Knight representative or send an email to the Knight's Servo Team at servos@knightglobal.com. (Refer to Figure 5-19)

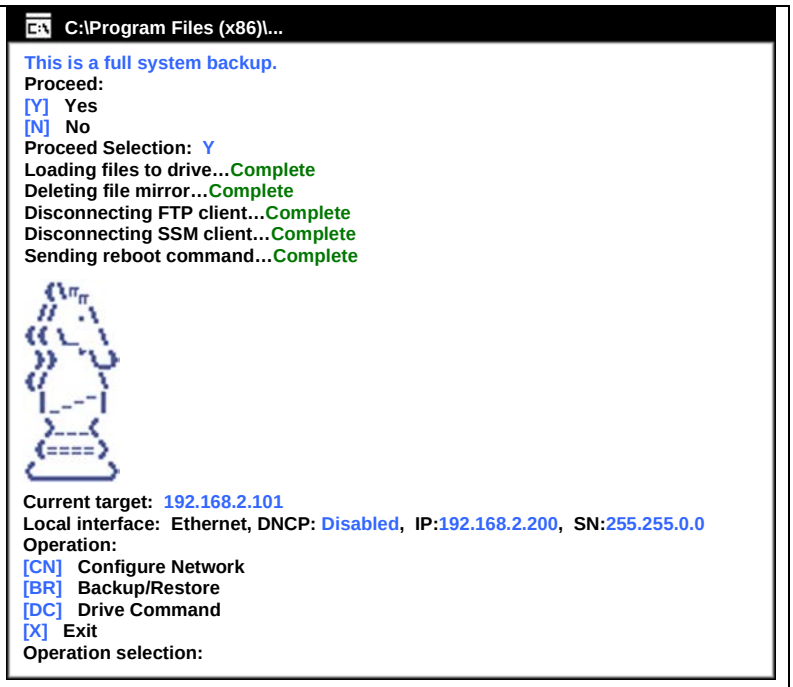


Figure 5-19

F. Review the software's Firmware and the servo's Hardware compatibility

Before a New Servo Drive is installed, ensure that the software's Firmware is compatible with the new servo drive's Hardware version.

Step 1. To find the system's software Firmware's version open the Knight Servo Studio (KSS) and look at the "Quick View" screen located in the lower right-hand corner. (Refer to Figure 5-20)

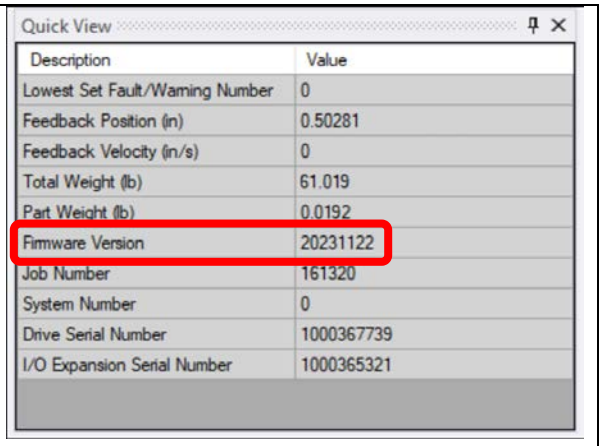


Figure 5-20

Step 2. The servo's Hardware version can be found on a label located on the side of the servo. (Refer to Figure 5-21)

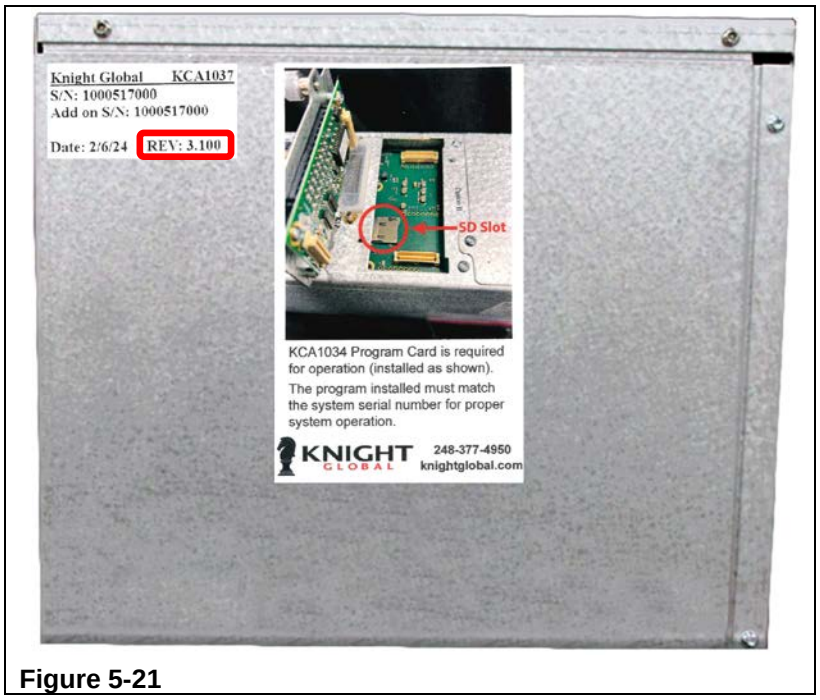


Figure 5-21

Step 3. Compare the software's Firmware and the to the Hardware version of the servo drive.

- If the new drive has a Hardware version of "V1", any Firmware version will work.
- If the new drive has a Hardware version of "V2 or V3", only certain Firmware versions will work.

(Refer to Figure 5-22)

Hardware Version	Firmware Compatability
V1 Drive	ANY.
V2 and V3	**20200311** and Newer.
	20190815 - 20200109 will boot, potential for encoder roll over on a power cycle.
	20180918 and Older will not boot.

Figure 5-22

Step 4. Considering the information shown above, the Firmware version is '20231122' and the Hardware version is '3.1'.
This combination is a match.

G. Load a New Drive with Existing Software

This section of the manual explains how to copy the Knight drive files from an old drive to a new drive.

Step 1. Lower the hoist's support fixture and part so that no load is suspended from the hoist.

	WARNING
	There can be NO load suspended from the hoist prior to replacing a drive.

Step 2. Press the Run-Stop button.

Step 3. Remove the 240VAC power from the system.

Step 4. In order to remove the old Drive from the Enclosure, remove the two #3 Phillips screws and then the cover from the top of the hoist's enclosure. (Refer to Figure 5-23)

Figure 5-23

Step 5. Remove all of the connectors attached to the servo drive: (Refer to Figure 5-24)

- X20: 24-pin connector.
- X18: Encoder cable.
- X21: D-sub connector.
- X14: Ethernet connector.
- X25: 24-pin connector.

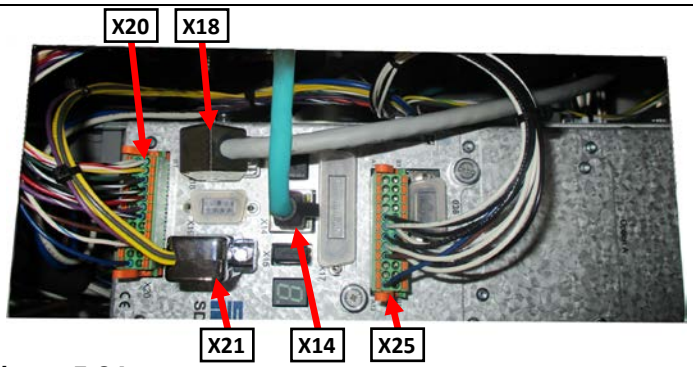


Figure 5-24

Step 6. Remove the (2) two 10mm nuts that secure the servo to the bottom plate using a metric deep well socket wrench. The (2) two button head bolts that the nuts thread onto are 6mm and if they back out use a 4mm Hex wrench to secure them.

Step 7. Remove all of the connectors attached to the back and front panels of the servo drive:

- X45: Motor power connector.
- X63: Resistor connector.
- Motor Power Cable Ground.
- X44: Incoming power connector.
- X100: Safety connector.
- 4mm button head screw for grounding wire.

(Refer to Figures 5-25 and 5-26)

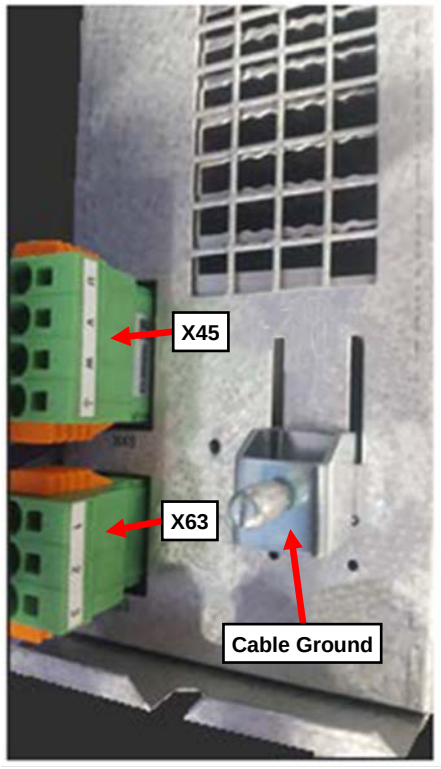


Figure 5-25

Figure 5-26

Step 8. Remove the I/O Modules from both old and new drives. This is accomplished by loosening the thumbscrews (use a #1 Philips if necessary) and then carefully lifting the I/O Module up off the top of the servo. (Refer to Figures 5-27)

Step 9. The SD card is now accessible and can be seen in the old drive. (Refer to Figures 5-28)

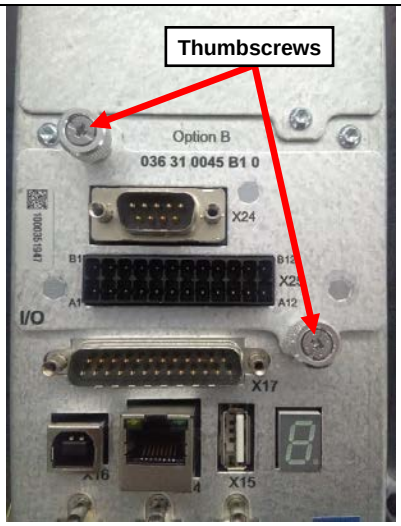


Figure 5-27

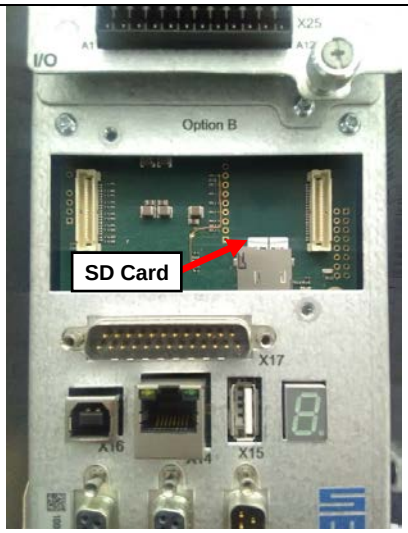


Figure 5-28

Step 10. Place you finger on the circuit board in front of the SD card. When the SD card is released, it will spring back with enough force to move several inches. See Note below. (Refer to Figure 5-29)

Step 11. Eject the SD card by pressing it in with your other index finger and then allowing it to spring back. (Refer to Figure 5-30)

Figure 5-29

Figure 5-30

NOTE

When released, the SD card may spring out of the slot quickly. If there is nothing in front of the SD card, it may be ejected with enough force to move several inches and possibly drop down inside the servo.

After the SD Card is released, if it doesn't move forward far enough to be removed from the slot, you may need to move your finger off of the card more quickly.

Step 12. Label the SD card and keep it safe and accessible for replacement.

Step 13. Prepare the new Sieb and Meyer servo drive obtained from Knight Global for installation.

Step 14. Install the SD card into the new drive. This will guarantee that all of the parameters that depict the functionality of the system will be maintained.

Step 15. Re-install the I/O module into the new drive. Do not apply an excessive amount of force.
The I/O module should easily slide into place if it is lined up correctly.
Tighten the thumbscrews fully by hand, before using a #1 Philips screwdriver;
Ensure the screws do not strip when tightening.

Step 16. Re-secure the new drive to the bottom plate of the hoist's enclosure and reattach all of the cable connectors:

- X20: 24-pin connector.
- X18: Encoder cable.
- X21: D-sub connector.
- X14: Ethernet connector.
- X25: 24-pin connector.
- X45: Motor power connector.
- X63: Resistor connector.
- Motor Power Cable Ground.
- X44: Incoming power connector.
- X100: Safety connector.
- 4mm button head screw for grounding wire.

Step 17. Reinstall the cover on top of the hoist's enclosure. (Refer to Figure 5-23)

Step 18. Re-connect the 240VAC power to the drive.

Step 19. Depending on the type of system you have:
If your system has an Inline handle, the Run-Stop red light and the green light will flash on and off briefly when the Servo Hoist has reinitialized.
If your system has a Fixture or Remote Two-Speed handle, it will enter No Mode.
This will take 1-2 minutes after the unit has been powered up.

Step 20. Connect to the Servo Hoist by following the 5.B. "Connecting to a Servo Hoist" procedure.

Step 21. Check for any Drive Faults. A fault will be designated by an illuminated red box next to the fault's description on the Active Fault screen. See Chapter 7.B. for details. (Refer to Figure 5-31)

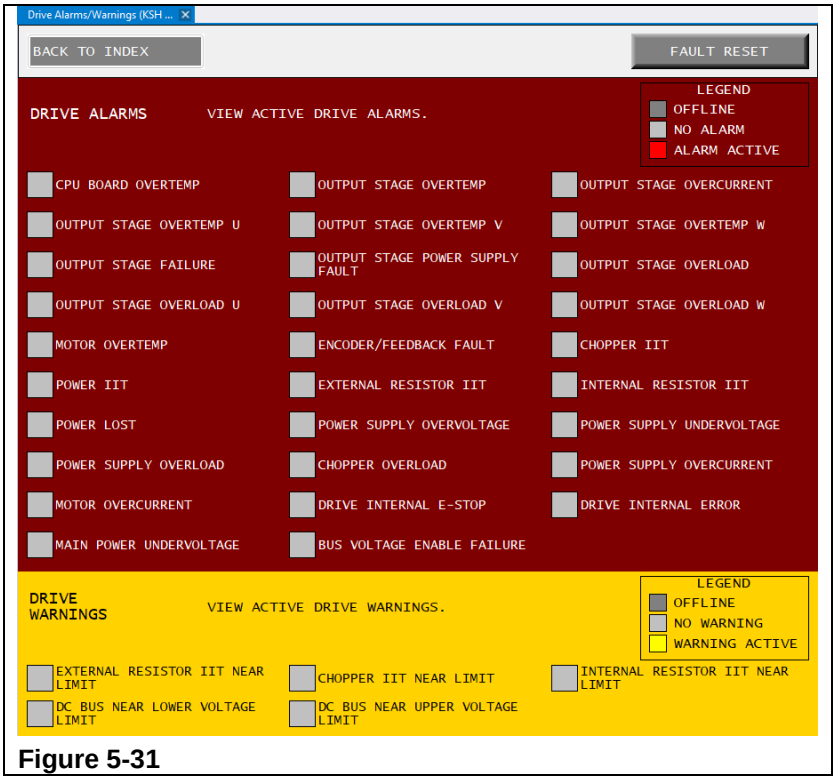


Figure 5-31

KSS Workspace tree location: Knight Work Order # \ Status \ Drive Alarm/Warnings

Step 22. Check for any Drive Warnings. A warning will be designated by an illuminated yellow box next to the warning's description on the Active Warnings screen. See Chapter 7.B. for details. (Refer to Figure 5-32)

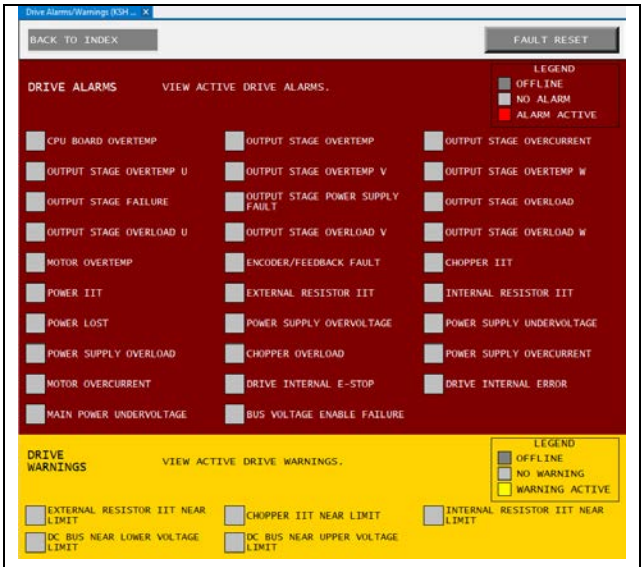


Figure 5-32

KSS Workspace tree location: Knight Work Order # \ Status \ Drive Alarm/Warning

Step 23. If the I/O devices connected to the I/O module are not working, verify that the X20 or X25 terminal block is correctly seated into the Remote I/O Module and that the module is installed properly into the servo drive.

Step 24. If the unit doesn't work properly, follow the troubleshooting screens located inside the Knight Servo Studio under the Troubleshooting branch of Workspace directory tree. (Refer to Figure 5-33)

Refer to Chapter 7 for a complete description of each screen listed on the directory tree below.

Figure 5-33

H. Check or Change Setup Values

The Knight Servo Studio Servo software can be used to setup the Knight servo drive. Follow these steps to configure the servo drive after a laptop has been connected to the system.
Refer to section 5.B. “Connecting to a Servo Hoist”.

Step 1. Just below the top menu bar is a window named ‘Workspace’.
There will be a ‘+’ sign next to the Job Number of the Knight servo you are doing maintenance on.
Press this ‘+’ button and a selection tree will appear.

Step 2. Mouse down the selection tree to ‘Setup’. Press the ‘+’ sign next to the ‘Setup’ selection.
Double-click on the appropriate screen or press the ‘SETUP’ button on the main screen.

Step 3. If a particular screen is required, press the ‘PREVIOUS’ or ‘NEXT’ button.

SETUP INDEX screen: (Refer to Figure 5-34)

Press the “SETUP” button on the ‘Start’ screen to display the ‘SETUP INDEX’ screen.

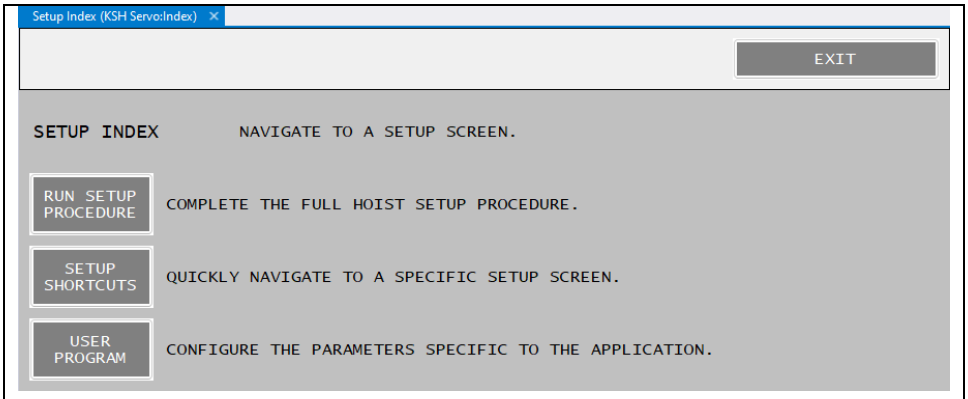


Figure 5-34

SETUP SHORTCUTS screen: (Refer to Figure 5-35)

By pressing the “SETUP SHORTCUTS” button on the ‘SETUP INDEX’ screen, this screen will be displayed. This screen will allow you to easily display many software functions.

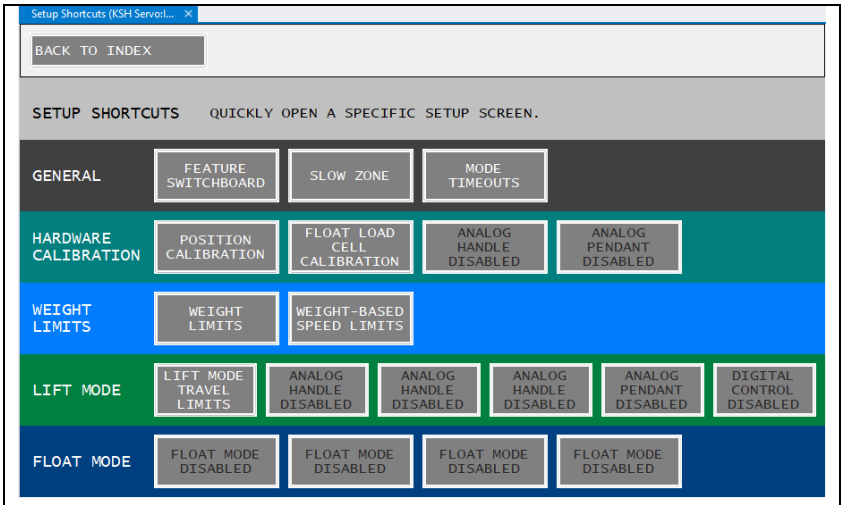


Figure 5-35

FEATURE SWITCHBOARD screen: (Refer to Figure 5-36)

By pressing the “RUN SETUP PROCEDURE” button on the ‘SETUP INDEX’ screen the ‘FEATURE SWITCHBOARD’ screen will be shown.

This should only be changed with the help of Knight service personnel.

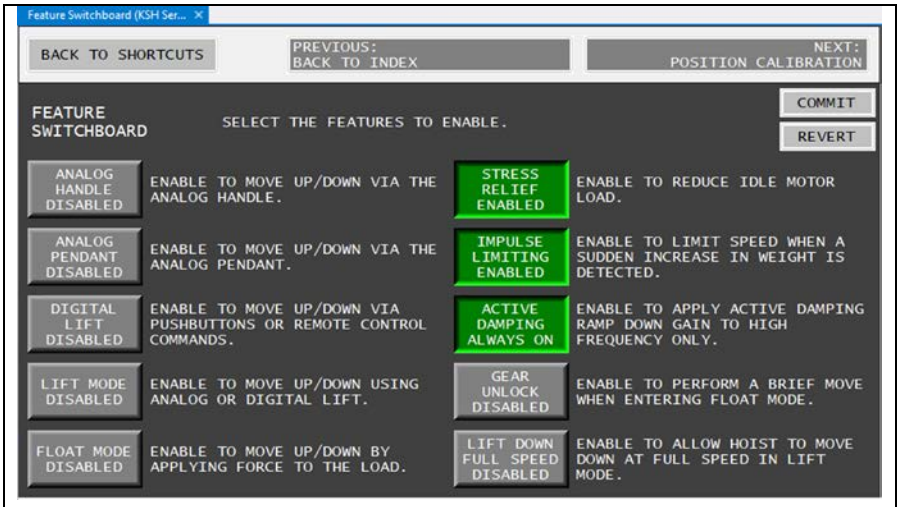


Figure 5-36

POSITION CALIBRATION screen: (Refer to Figure 5-37)

Encoder Offset set-up: Inputting a number into the ‘FEEDBACK POSITION (IN)’ box and pressing the ‘SET HOME POSITION’ button will equate the ‘Current Position’ of the hoist to that height.

The hoist is usually moved to its top position, a zero is entered into the ‘Home Position’ display, and the ‘Set Encoder Offset’ button is pressed equating this top position to zero inches.

Refer to section “5.I.) Encoder Offset Setup Procedure“.

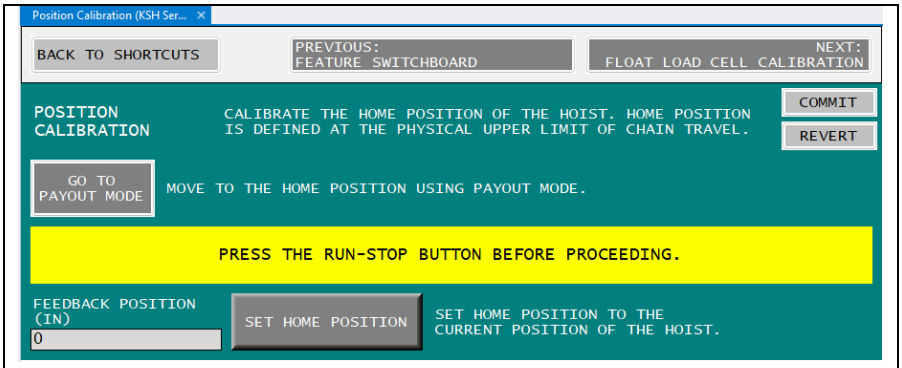


Figure 5-37

FLOAT LOAD CELL CALIBRATION screen: (Refer to Figure 5-38)

Float Load Cell setup: The 'SET FLOAT LOAD CELL BIAS' button should only be pressed if there is nothing hanging from the bottom of the Load Monitoring Module (LMM).
This button is usually only pressed when the LMM has been replaced.

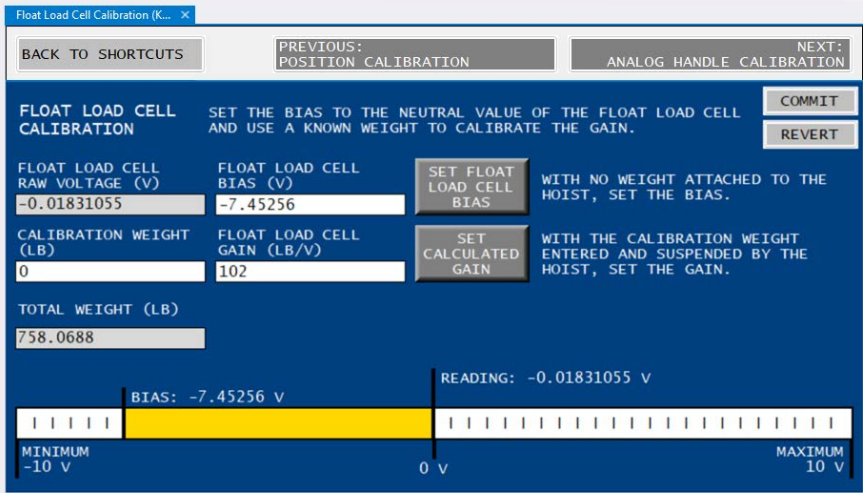


Figure 5-38

ANALOG HANDLE CALIBRATION screen: (Refer to Figure 5-39)

Analog Handle setup: This must be calibrated when there is no force applied to the handle.

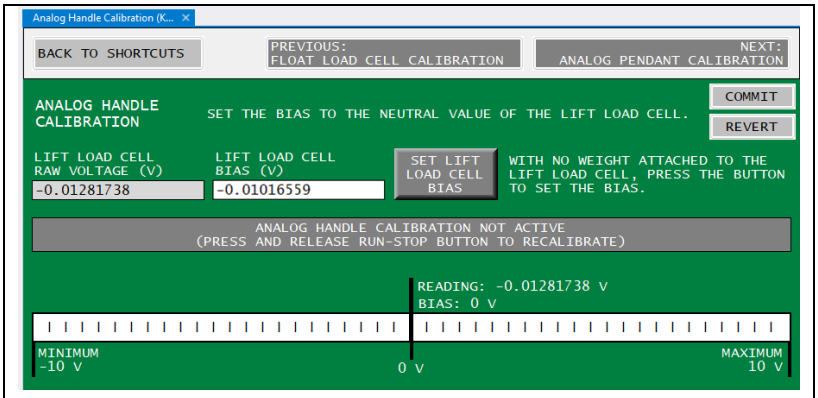


Figure 5-39

ANALOG PENDANT CALIBRATION screen: (Refer to Figure 5-40)

Analog Pendant Calibration setup: This screen is used to calibrate a new analog pendant's voltage so it can be used to control the servo's up / down movement.

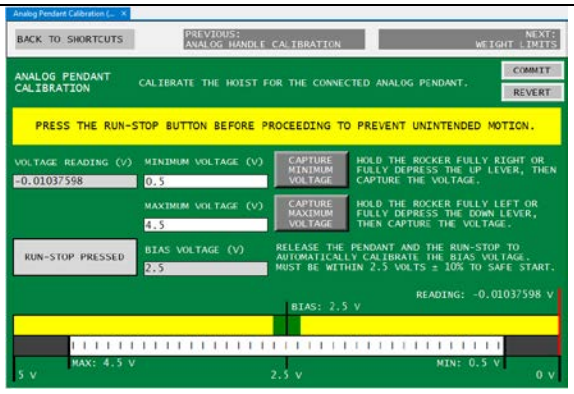


Figure 5-40

ANALOG PENDANT COMMAND screen: (Refer to Figure 5-41)

Analog Pendant Command setup: This screen is used to configure the speeds and accelerations for the analog handle. Also, the number of speed bands or continuous speed increase can be set.

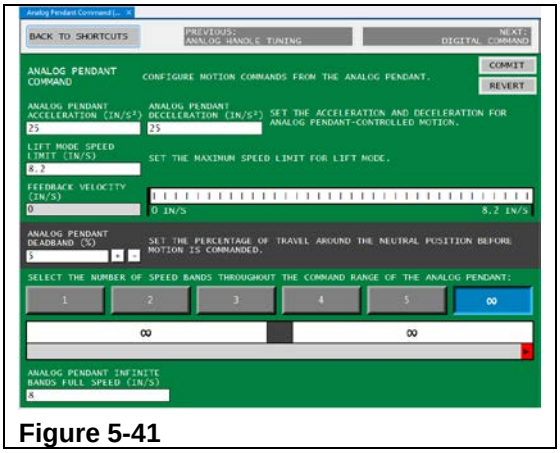


Figure 5-41

WEIGHT LIMITS screen: (Refer to Figure 5-42)

Fixture Weight setup: If the weight of the fixture changes, ensure that the fixture is hanging free without a part or any extra weight hanging from it and press the 'SET FIXTURE WEIGHT TO CURRENT WEIGHT' button to change the 'Fixture Weight (lb)' to the current 'Total Weight (lb)' displayed.

Maximum Total Weight: This is the total amount of weight that the servo will lift. If this value is exceeded the servo will stop moving upward (UpStop).

Minimum Part Weight: This is the amount of weight that the servo will set down on a surface. It also ensures that the servo will not pay-out additional chain when the part is set down (DownStop).

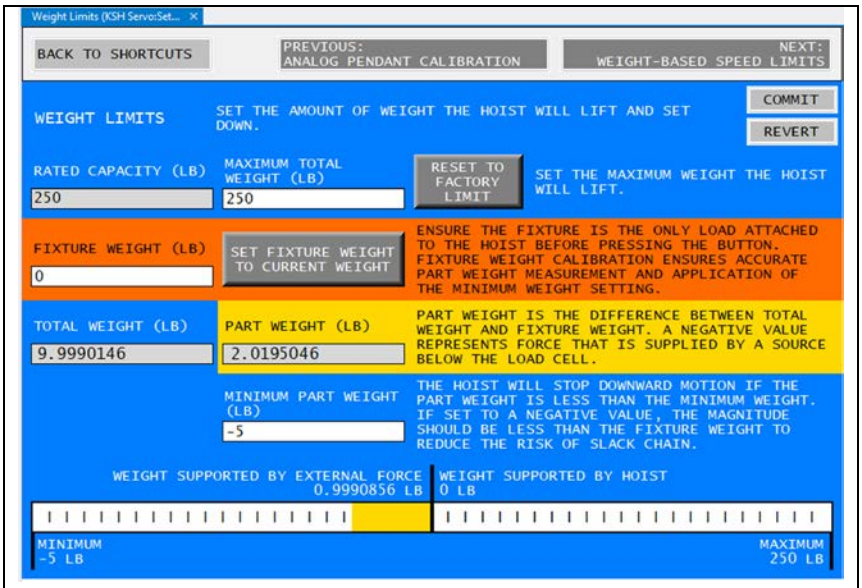


Figure 5-42

WEIGHT-BASED SPEED LIMITS screen: (Refer to Figure 5-43)

Speed setup: These speeds take precedence over the speed limits set for either the analog or digital handles. These values should not be changed without direction from Knight personnel.

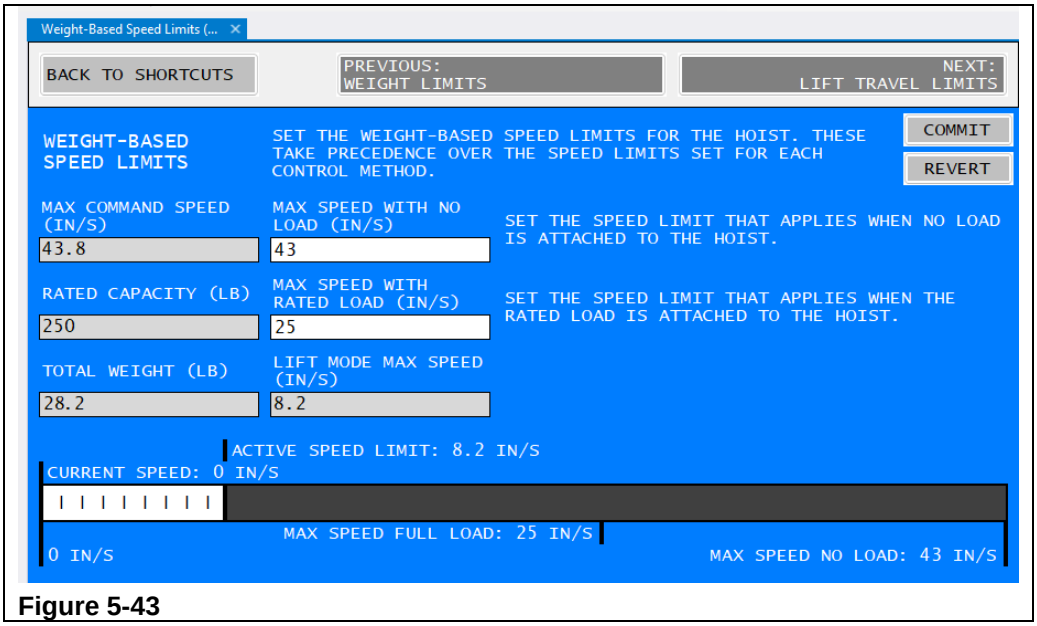


Figure 5-43

LIFT MODE TRAVEL LIMITS screen: (Refer to Figure 5-44)

Upper / Lower limits: These rows display the absolute Upper and Lower Limits of the Servo Hoist.
The Upper limit starts just below the hoist plus the coil cable's stack up and is considered 0".
The Lower limit can NOT exceed the maximum length of the coil cable, i.e. an 8' coil cable = 96".

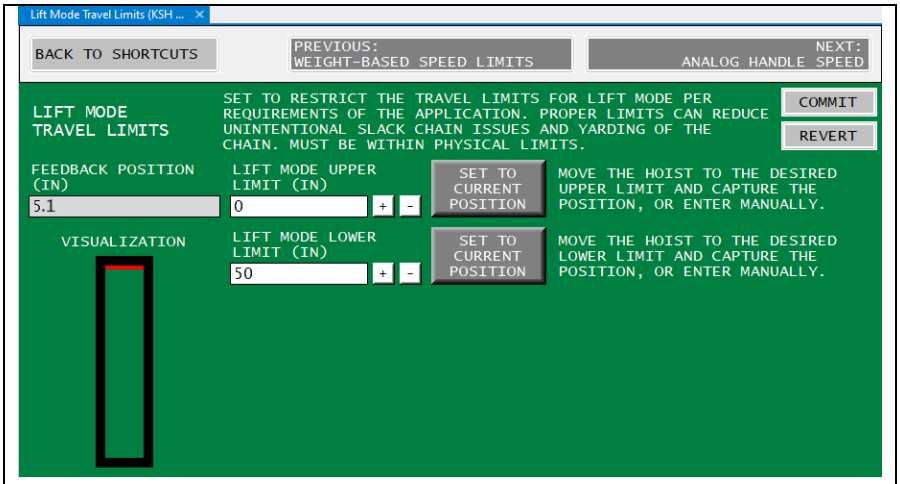


Figure 5-44

ANALOG HANDLE SPEED screen: (Refer to Figure 5-45)

Inline or Fixture Handle speeds: Set the speed and acceleration limits that apply to analog handle controls.

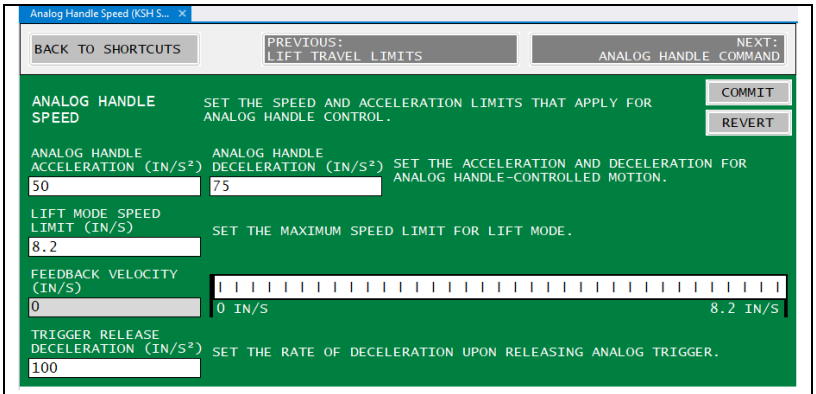
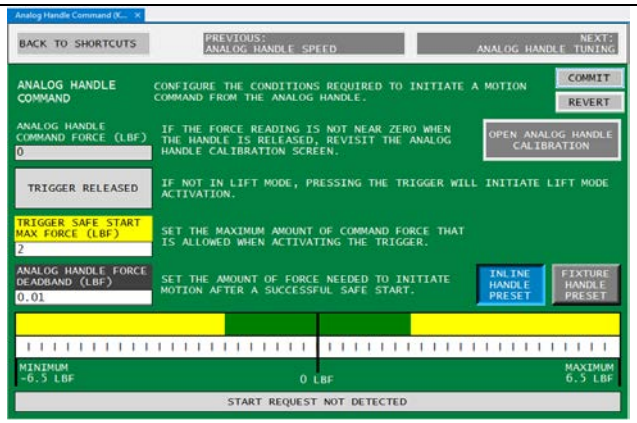


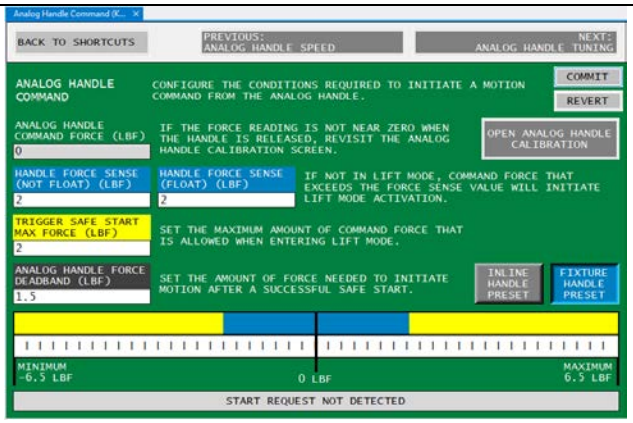
Figure 5-45

ANALOG HANDLE COMMAND screen: (Refer to Figure 5-46)

Inline or Fixture Handle commands: Configure the conditions required to initiate a motion command from the analog handle.



Inline Handle Screen



Fixture Handle Screen

Figure 5-46

ANALOG HANDLE TUNING screen: (Refer to Figure 5-47)

Tune motion control with the analog handle.

Slow: Slower system response to analog handle input.
Normal: Standard system response to analog handle input.
Fast: Faster system response to analog handle input.

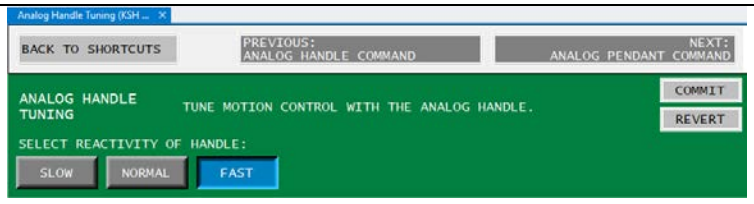


Figure 5-47

DIGITAL CONTROL COMMAND screen: (Refer to Figure 5-48)

Configure motion commands from the digital control.

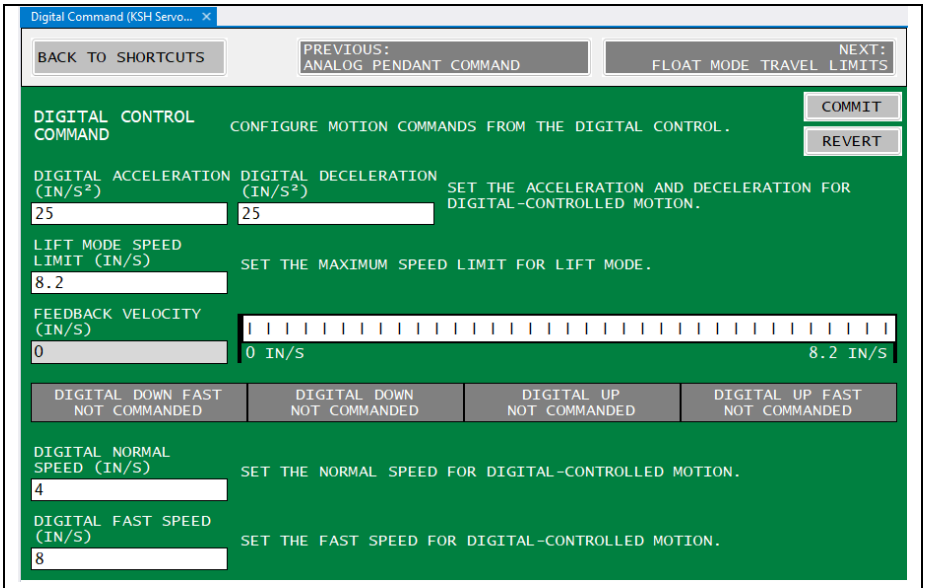


Figure 5-48

FLOAT MODE TRAVEL LIMITS screen: (Refer to Figure 5-49)

Set to restrict the travel limits for float mode per requirements of the application. Proper limits can reduce unintentional collisions. These settings are restricted by the overall travel limits.

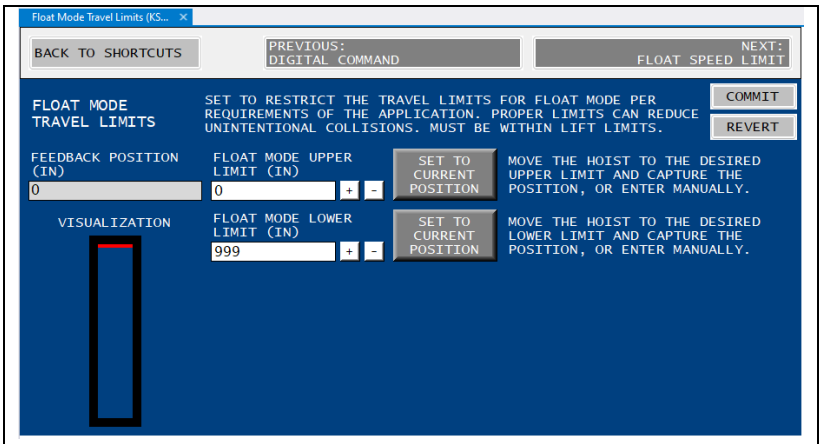


Figure 5-49

FLOAT MODE SPEED screen: (Refer to Figure 5-50

Set the speed and acceleration limits that apply for float mode.

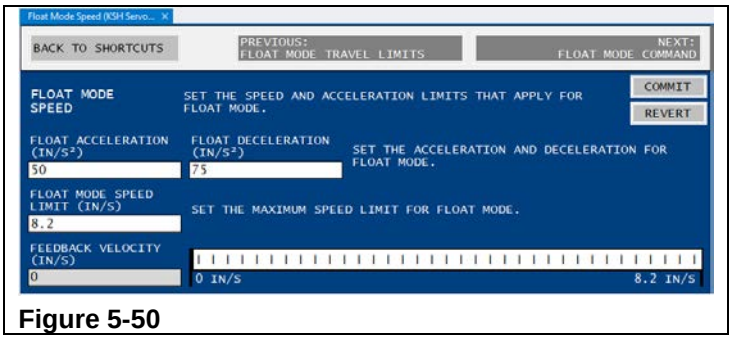


Figure 5-50

FLOAT MODE COMMAND screen: (Refer to Figure 5-51)

Configure the input required to initiate a float mode motion command.

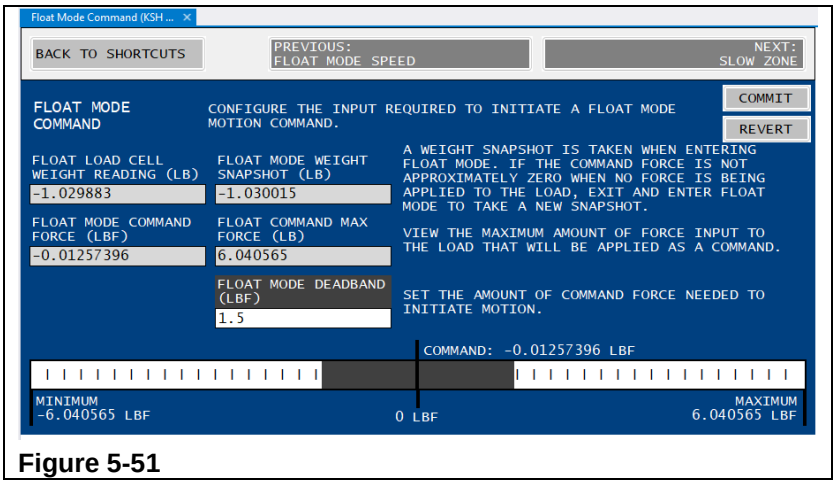


Figure 5-51

SLOW ZONE screen: (Refer to Figure 5-52)

Configure a zone within the hoist's range of travel with a reduced speed limit in one or both directions of travel.

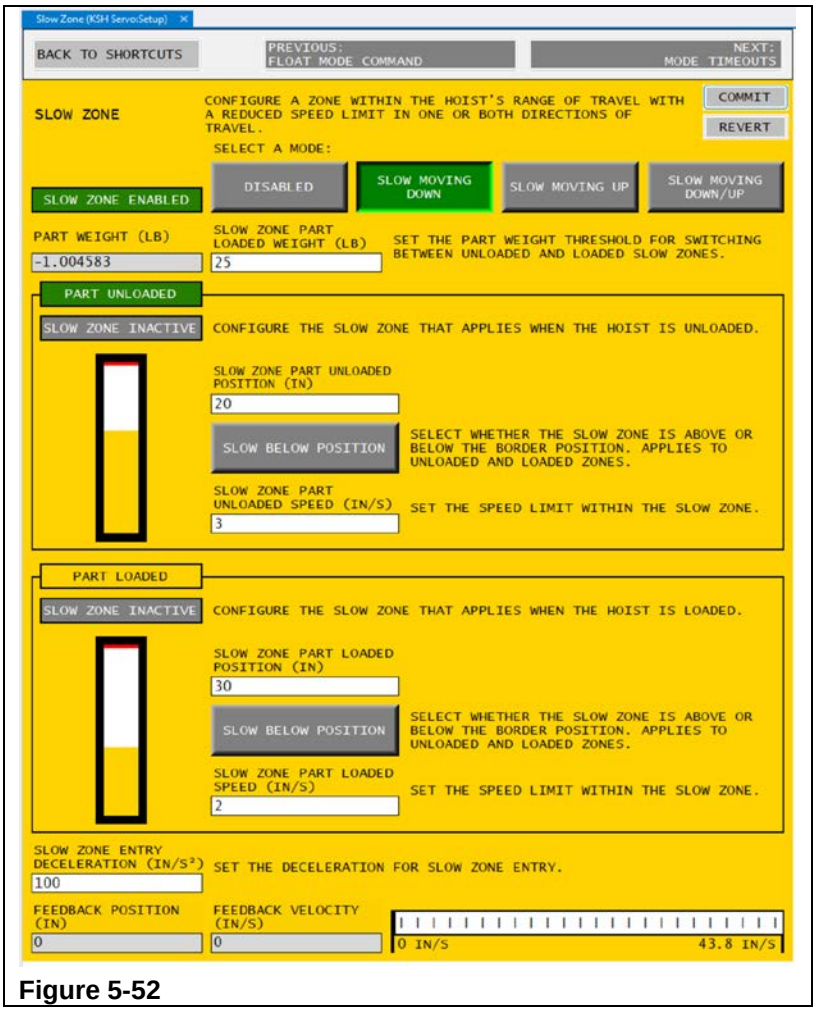


Figure 5-52

MODE TIMEOUTS screen: (Refer to Figure 5-53)

Configure the timeout durations for each mode.

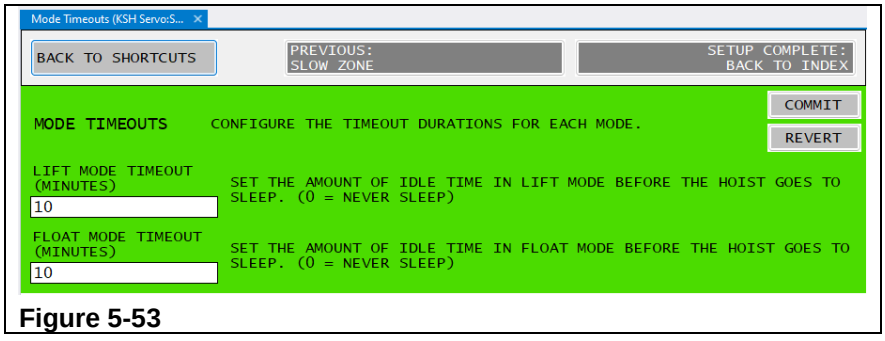


Figure 5-53

NOTE: If any of the selections are changed on any of the screens, the "COMMIT" must be pressed to have the values committed.

I. Encoder Offset Setup Procedure

The Knight Servo Studio Servo software can be used setup Encoder Offset position of the servo. Refer to section 5.B. “Connecting to a Servo Hoist”.

Step 1. Ensure that the servo is free to be moved to its upper-most position.

Step 2. Move the fixture or inline handle to the overall top position.
This should be the maximum top point that the servo will have to travel up to but should be low enough not to cause damage to the 19-pin coil cable.

	CAUTION
⚠	**The 19-pin coil cable should not be compressed when the hoist is in the full up or zero position.** **There should be additional room below the servo so a two-inch (2”) spacer could be inserted between the coils of the 19-pin coil cable when the hoist is in the full up position.**

Step 3. Bring up the “POSITION CALIBRATION” screen.

Step 4. Press the ‘SET HOME POSITION’ button. This will set the ‘Current Position (in)’ of the hoist to the ‘Home Position (in)’.
The ‘Commit’ button located on the upper Right-hand side of the panel will turn yellow.

Step 5. Press the ‘Commit’ button. This will equate the current position of the hoist to its upper most or zero location. (Refer to Figure 5-54)

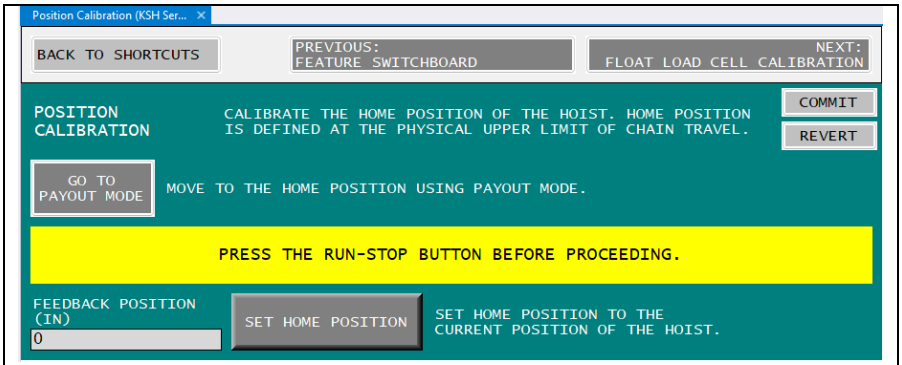


Figure 5-54

J. Operating Chain Payout Mode

The ‘Chain Payout’ mode can be initiated from the Knight Servo Software.

Step 1. Mouse to the ‘Workspace’ panel and select the ‘+’ next to the Knight Work Order Number.

Step 2. Next, mouse to and select the ‘+’ next to ‘Motion’ and then double-click on ‘Payout Mode’.

Step 3. This will display a screen labeled ‘Chain Payout (Job Number: Motion)’.

Chain Payout screen: (Refer to Figure 5-55)

Row #1) Set the ‘PAYOUT MODE SPEED’. This should be set between 1 to 5.
The ‘Stop’ button will stop the movement of the hoist.

Row #2) The ‘PAYOUT MODE BACKOFF DISTANCE (in)’ is for Knight internal use only and should be set to ZERO while Payout Mode is being used.
The ‘Pay Out’ button will start Paying OUT the chain.
The chain will move down toward the bottom limit of the servo.

Row #3) Set the ‘PAYOUT MODE TORQUE LIMIT (%)’. The default is set to 10%; this may have to be increased for some applications.
Caution MUST be taken as damage may be caused to the servo or personnel if this value is set too high for a particular system.

WARNING

The ‘PAYOUT MODE TORQUE LIMIT (%)’ The default is set to 10%; this may have to be increased for some applications.
Caution MUST be taken as damage may be caused to the servo or personnel if this value is set too high for a particular system.

The ‘START PAY IN’ button will start Paying IN the chain.
The chain will move up toward the top limit of the servo.

Row #4) The “TORQUE FEEDBACK (%)” is a real-time numerical display of the motor’s torque.
The scale is a visual representation of this value.

Row #5) Commit Row: If ANY of the values above are changed, the ‘Commit’ button will turn yellow and must be pressed for that change to be processed by the servo.

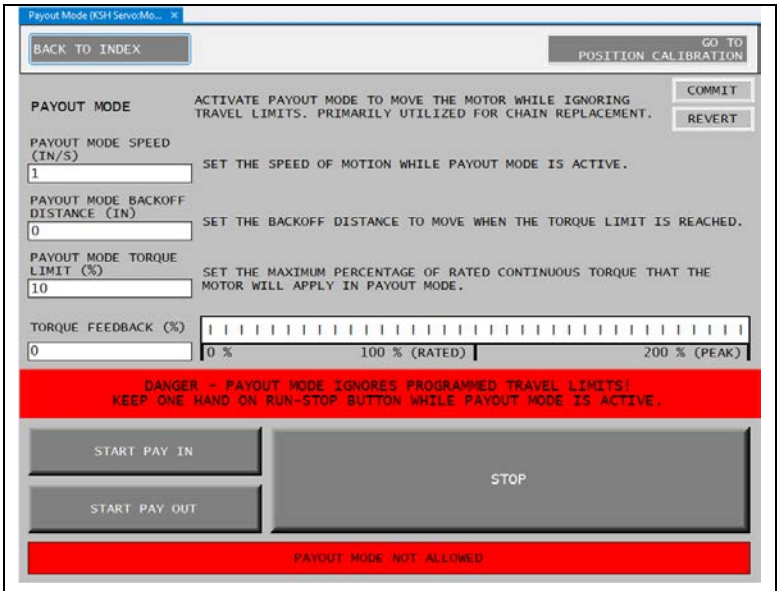


Figure 5-55

K. Accessing the Servo Hoist's Fault Log

The servo drive's Fault Log is accessible from its web page.

Step 1. Open your web browser and enter on the hoist's IP Address in the address bar. This will be 192.168.2.101 in most cases.

Step 2. The web page will be similar to what is shown in Figure 5-56.

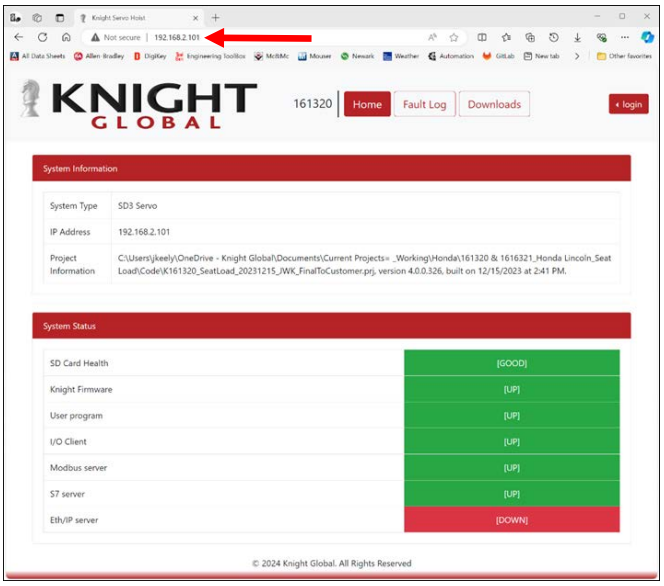


Figure 5-56

Step 3. Select the 'Fault Logs' button to see a list of all the faults recorded by the servo. Each fault will have a 'Fault ID', a 'Description', the time the fault occurred and the duration the fault lasted. (Refer to Figure 5-57)

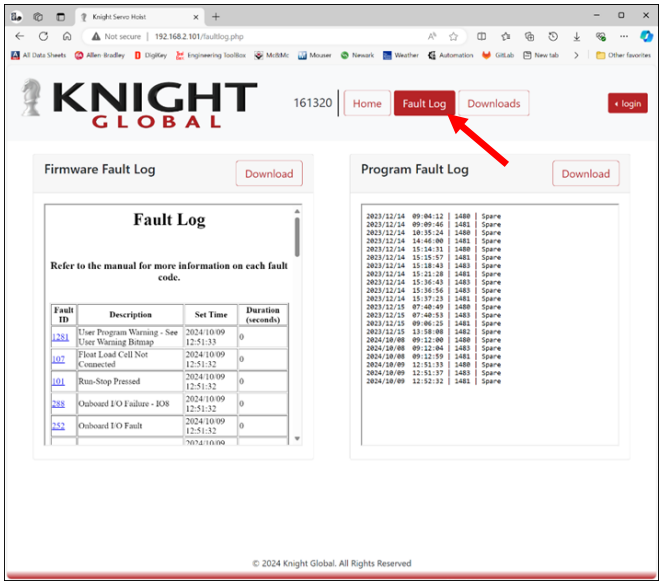


Figure 5-57

Step 4. Select the ‘Downloads’ button to see the available options to transfer information from the servo.

- Software: Knight Servo Configuration Software.
- Manual: Knight Servo Hoist Manual.
- Documentation:
  - Manual Addendum: Operation manual addendum for this system / job number.
  - Drawings: Electrical and mechanical drawings.
  - Spare Parts List: Recommended spare parts for this system / job number.

(Refer to Figure 5-58)

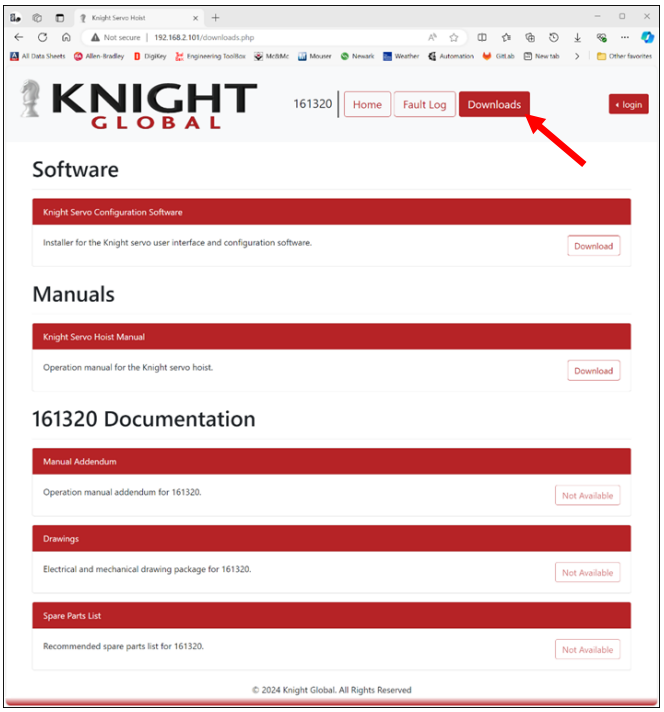


Figure 5-58

6. PARAMETER DESCRIPTIONS

There are several parameter status arrays described in this section:

6.A.) iSTS Status Array
6.B.) fSTS Status Array
6.C.) fSTS Extended Status Array
6.D.) F8L1 Parameter Array
6.E.) User Retained Variables Parameter Array
6.F.) F8L2 Parameter Array

A. iSTS Status Array

This array is reserved for integer numbers.

iSTS:00 – Firmware Version
Variable Units: N/A
Description: This parameter displays the current firmware version of the servo's software.
KSS Workspace tree location: Quick View panel \ Row 6 (Lower right-hand portion of the screen).

iSTS:01 – Drive Serial Number
Variable Units: N/A
Description: This parameter displays the serial number of the servo drive.
KSS Workspace tree location: Quick View panel \ Row 9 (Lower right-hand portion of the screen).

iSTS:02 – I/O Expansion Serial Number
Variable Units: N/A
Description: This parameter displays the serial number of the I/O Expansion card installed on the servo drive.
KSS Workspace tree location: Quick View panel \ Row 10 (Lower right-hand portion of the screen).

iSTS:03 through iSTS:49 – Servo Department's use
Variable Units: N/A
Description: These parameters are for internal use only.

iSTS:50 – Job Number
Variable Units: N/A
Description: This parameter displays the Job Number for the servo hoist system.
KSS Workspace tree location: Quick View panel \ Row 7 (Lower right-hand portion of the screen).

iSTS:51 – System Number
Variable Units: N/A
Description: If there are multiple systems related to the job number, this parameter displays the individual system number for the servo hoist system.
KSS Workspace tree location: Quick View panel \ Row 8 (Lower right-hand portion of the screen).

iSTS:52 through iSTS:127 – Job Specific
Variable Units: N/A
Description: These parameters display job specific information for the servo hoist system.

B. fSTS Status Array

This Global Array is used as a status file to review the current state of the Servo Hoist.

These parameters are listed in the fSTS array and can be displayed at:
KSS Workspace tree location: Knight Work Order # \ Parameters \ fSTS \ Row xx.
Many of these parameters have equivalent displays located on various Knight Servo Studio (KSS) screens.
The location of these screens is listed at the end of each parameter's description.
See section 5. 'Software' for an explanation of the shorthand used.

fSTS:00 – Run-Stop
Variable Units: Boolean (0=Off, 1=On)
Description: This parameter displays a '1' if the Run-Stop button is in the run position and the 19-pin coil cable is connected to the Servo Hoist. It will be a '0' if the Run-Stop button is in the opened condition or if the 19-pin coil cable is disconnected.
KSS Workspace tree location: Knight Work Order # \ Status \ I/O Status

fSTS:01 – Lowest Set Fault/Warning Number
Variable Units: Fault #
Description: This parameter displays the current drive fault if one exists. If the number is between 1 and 310 then a drive fault has occurred and will be displayed on the Knight Servo Studio Active Fault screen.
A complete list of faults is listed in this manual in section 7 under the heading 'Error Codes'.
KSS Home screen location: Quick View panel \ Row 1 (Lower right-hand portion of the screen).
KSS Workspace tree location: Knight Work Order # \ Status \ Active Faults
KSS Workspace tree location: Quick View panel \ Row 1 (Lower right-hand portion of the screen).

fSTS:02 – (Fault 102) Bad Parameter #
Variable Units: Parameter Value
Description: If Fault 102 is active, this specifies the parameter with an invalid value as a three-digit value.
The first digit specifies the F8L parameter table, and the second two digits specify the index within that table.

fSTS:03 – Motor Max RPM (Read from Drive)
Variable Units: Revolutions per minute
Description: Specifies the maximum motor speed that is configured on the drive.

fSTS:04 – Current Mode (0=none, 1=Lift, 2=Float, 3=Position, 4=Payout)
Variable Units: Choice (0 = No Mode/Sleep, 1=Lift Mode, 2=Float Mode, 3=Test Mode)
Description: This parameter displays the current operating mode of the hoist.

fSTS:05 – Current Motion Time (s)
Variable Units: Seconds
Description: This parameter displays the time it took to complete the last cycle.

fSTS:06 – Analog Input 0 (V)
Variable Units: Volts
Description: This parameter displays the value of Analog Input #0 for internal purposes.

fSTS:07 – Analog Input 1 (V)
Variable Units: Volts
Description: This parameter displays the value of Analog Input #1 for internal purposes.

fSTS:08 – Analog Input 2 (V)
Variable Units: Volts
Description: This parameter displays the value of Analog Input #2 for internal purposes.

fSTS:09 – Analog Input 3 (V)
Variable Units: Volts
Description: This parameter displays the value of Analog Input #3 for internal purposes.

fSTS:10 – Float Load Cell Raw Voltage (V)
Variable Units: Volts
Description: This parameter displays the analog voltage from the float load cell.

fSTS:11 – Float Load Cell Filtered Voltage (V)
Variable Units: Volts
Description: This parameter displays an intermediate calculation of the force exerted on the float load cell.

fSTS:12 – Float Load Cell Bias Voltage (V)
Variable Units: Volts
Description: This parameter displays an intermediate calculation of the force exerted on the float load cell.

fSTS:13 – Float Load Cell Raw Weight Reading (lb)
Variable Units: Pounds
Description: This parameter displays an intermediate calculation of the force exerted on the float load cell.

fSTS:14 – Float Mode Command Force (lbf)
Variable Units: Pound Force
Description: A value generated when the operator puts a vertical force on the part holding fixture or part.

fSTS:15 – Total Weight (lb)
Variable Units: Pounds
Description: This parameter displays the entire weight measured by the Load Monitoring Module's load cell including the part, part holding fixture and any other material suspended below the Load Monitoring Module.

fSTS:16 – Float Mode Weight Snapshot (lb)
Variable Units: Pounds
Description: This is the weight recorded when the hoist is put into Float mode.

fSTS:17 – Part Weight (lb)
Variable Units: Pounds
Description: This parameter displays the weight of the part hanging from the fixture or inline handle.
KSS Home screen location: Quick View panel \ Row 6 (Lower right-hand portion of the screen).

fSTS:18 – Float Load Cell Weight - Fixture Weight (lb)
Variable Units: Pounds
Description: This parameter displays an intermediate calculation of the force exerted on the float load cell.

fSTS:19 – Float Load Cell Scaled Value (lb)
Variable Units: Pounds
Description: This parameter displays an intermediate calculation of the force exerted on the float load cell.

fSTS:20 – Lift Load Cell Raw Voltage (V)
Variable Units: Volts
Description: Analog voltage from the lift load cell.

fSTS:21 – Lift Load Cell Filtered Voltage (V)
Variable Units: Volts
Description: This parameter displays an intermediate calculation of the force exerted on the lift load cell.

fSTS:22 – Lift Load Cell Bias Voltage (V)
Variable Units: Volts
Description: This parameter displays an intermediate calculation of the force exerted on the lift load cell.

fSTS:23 – Lift Load Cell Raw Weight Reading (lb)
Variable Units: Pounds
Description: This parameter displays an intermediate calculation of the force exerted on the lift load cell.

fSTS:24 – Lift Load Cell Adjusted Weight (lb)
Variable Units: Pounds
Description: This parameter displays an intermediate calculation of the force exerted on the lift load cell.

fSTS:25 – Lift Load Cell Weight, Raw (lb)
Variable Units: Pounds
Description: This parameter displays the raw weight read from the Lift load cell.

fSTS:26 – Lift Load Cell Weight, Filtered (lb)
Variable Units: Pounds
Description: This parameter displays an intermediate calculation of the force exerted on the lift load cell.

fSTS:27 – Lift Load Cell Command Force (lbf)
Variable Units: Pound Force
Description: A value generated when the operator puts a force on an analog handle.

fSTS:28 – Spare

fSTS:29 – Motor Encoder Raw Position (in)
Variable Units: Inches
Description: This parameter displays the encoder information directly from the motor.

fSTS:30 – Feedback Position (in)
Variable Units: Inches
Description: This parameter displays the encoder position of the hoist.
KSS Workspace tree location: Knight Work Order # \ Setup \ Lift Mode Travel Limits.
KSS Home screen location: Quick View panel \ Row 2 (Lower right-hand portion of the screen).

fSTS:31 – Command Velocity (in/s)
Variable Units: Inches per second
Description: This parameter displays the velocity command generated after applying limiting conditions such as slow zone or impulse limiting.

fSTS:32 – Feedback Velocity (in/s)
Variable Units: Inches per second
Description: This parameter displays an Instantaneous feedback velocity of the hoist.

fSTS:33 – 2nd Float Load Cell Raw Voltage (V)
Variable Units: Volts
Description: This parameter displays information relating to a second float load cell.

fSTS:34 – 2nd Float Load Cell Filtered Voltage (V)
Variable Units: Volts
Description: This parameter displays information relating to a second float load cell.

fSTS:35 – 2nd Float Load Cell Bias Voltage (V)
Variable Units: Volts
Description: This parameter displays information relating to a second float load cell.

fSTS:36 – Feedback Acceleration (in/s²)
Variable Units: Inches per second^2
Description: This parameter displays the feedback acceleration of the hoist.

fSTS:37 – Lift Mode Command Velocity (in/s)
Variable Units: Inches per second
Description: This parameter specifies the velocity that is being commanded by Lift Mode control.

fSTS:38 – Float Mode Command Velocity (in/s)
Variable Units: Inches per second
Description: This parameter specifies the velocity that is being commanded by Float Mode control.

fSTS:39 – Lift Mode Max Speed (in/s)
Variable Units: Inches per second
Description: This parameter displays the maximum allowed speed of the hoist when in Lift Mode.

fSTS:40 – Float Mode Max Speed (in/s)
Variable Units: Inches per second
Description: This parameter displays the maximum allowed speed of the hoist when in Float Mode.

fSTS:41 – Max Motor Speed (in/s)
Variable Units: Inches per second
Description: This parameter displays the maximum speed the hoist can move.

fSTS:42 – Max Command Speed (in/s)
Variable Units: Inches per second
Description: This parameter displays the maximum allowed command speed the hoist will accept.

fSTS:43 – Command Current (A)
Variable Units: Amps
Description: This parameter displays the instantaneous command current of the hoist.

fSTS:44 – Spare

fSTS:45 – Total Program Run Time (days)
Variable Units: Days
Description: This parameter displays the total number of days the system has been active since delivery.

fSTS:46 – Total Distance (in)
Variable Units: Inches
Description: This parameter displays the overall distance the servo has traveled since delivery.

fSTS:47 – Lift Mode Distance (in)
Variable Units: Inches
Description: This parameter displays the total distance the servo has traveled while in Lift Mode.

fSTS:48 – Float Mode Distance (in)
Variable Units: Inches
Description: This parameter displays the total distance the servo has traveled while in Float Mode.

fSTS:49 – Position Mode Distance (in)
Variable Units: Inches
Description: This parameter displays the total distance the servo has traveled while in position mode.

fSTS:50 through fSTS:127
Variable Units: N/A
Description: These parameters are reserved for application specific status variables where applicable.
Reference job specific manual addendum for additional information if populated

C. fSTS Extended Status Array

This Global Array is used as an extended status file to review the current state of the Servo Hoist.

These parameters are listed in the fSTS Extended array and can be displayed at:
KSS Workspace tree location: Knight Work Order # \ Parameters \ fSTS Extended \ Row xx.

fSTS Extended:00 – Active Upper Limit (in)
Variable Units: Inches
Description: This parameter displays the hoist's upper limit that is currently being evaluated by the program.

fSTS Extended:01 – Active Lower Limit (in)
Variable Units: Inches
Description: This parameter displays the hoist's lower limit that is currently being evaluated by the program.

fSTS Extended:02 – Active Up Stop Weight (lb)
Variable Units: Pounds
Description: This parameter displays the hoist's up stop weight that is currently being evaluated by the program.

fSTS Extended:03 – Active Down Stop Weight (lb)
Variable Units: Pounds
Description: This parameter displays the hoist's down stop weight that is currently being evaluated by the program.

fSTS Extended:04 – Analog Handle Command Force Limit (lbf)
Variable Units: Pound Force
Description: This parameter displays the maximum force that can be applied to the analog handle before a fault is generated.

fSTS Extended:05 – Calculated Lift Command Force (lb) *(Reference Only)
Variable Units: Pound
Description: This parameter displays the maximum force required to reach Lift mode Max Speed.

fSTS Extended:06 – Float Command Max Force (lb)
Variable Units: Pound
Description: This parameter displays the maximum force required to reach Float mode Max Speed.

fSTS Extended:07 – Run-Stop Minimum Deceleration (in/s²)
Variable Units: Inches per second^2
Description: This parameter displays the deceleration of the hoist when the Run-Stop button is pressed.

fSTS Extended:08 and fSTS Extended:09 – Spare

fSTS Extended:10 through 12 – Servo Department's use
Variable Units: N/A
Description: These parameters are for internal use only.

fSTS Extended:13 – Final Command Output Velocity (in/s)
Variable Units: Inches per second
Description: This parameter displays the target output velocity for the servo motor.

fSTS Extended:14 – Spare

fSTS Extended:15 – Analog Handle Command Force (lbf)
Variable Units: Pound Force
Description: This parameter displays the force that is currently being applied to the analog handle.

fSTS Extended:16 – Analog Pendant Safestart Min Voltage (V)
Variable Units: Voltage
Description: This parameter displays the Min Voltage threshold for capturing the Analog Pendant Bias.

fSTS Extended:17 – Analog Pendant Safestart Max Voltage (V)
Variable Units: Voltage
Description: This parameter displays the Max Voltage threshold for capturing the Analog Pendant Bias.

fSTS Extended:18 – Spare

fSTS Extended:19 – Total Drive Power On Time (days)
Variable Units: Days
Description: This parameter displays the total number of days the servo drive has been powered on.

fSTS Extended:20 – Total Program Run Time (days)
Variable Units: Days
Description: This parameter displays the total number of days the system has been active since delivery.

fSTS Extended:21 – Spare

fSTS Extended:22 – Stress Relief Upper Limit (in)
Variable Units: Inches
Description: This parameter displays the upper travel limit for Stress Relief motion

fSTS Extended:23 – Stress Relief Capture Position (in)
Variable Units: Inches
Description: This parameter displays the feedback position when captured when entering Stress Relief.

fSTS Extended:24 – Stress Relief Lower Limit (in)
Variable Units: Inches
Description: This parameter displays the lower travel limit for Stress Relief motion.

fSTS Extended:25 – Stress Relief Output Velocity (in)
Variable Units: Inches
Description: This parameter displays the output velocity of stress relief control.

fSTS Extended:26 – Spare

fSTS Extended:27 – Impulse Limiting On Threshold (lbs)
Variable Units: Pounds
Description: This parameter displays the minimum weight required to activate impulse limiting.

fSTS Extended:28 – Impulse Limiting Off Threshold (lbs)
Variable Units: Pounds
Description: This parameter displays the minimum weight required to turn off impulse limiting if active.

fSTS Extended:29 through fSTS Extended:34 – Spare

fSTS Extended:35 – Ratchet Brake Backoff Move Time (sec)
Variable Units: Seconds
Description: This parameter displays the total time taken for the ratchet brake to release. (Only applies to systems equipped with ratchet brake.)

fSTS Extended:36 – Ratchet Brake Prox Read Delay Time (sec)
Variable Units: Seconds
Description: This parameter displays the time from ratchet brake solenoid activation to ratchet brake release confirmation. (Only applies to systems equipped with ratchet brake.)

fSTS Extended:37 – Ratchet Brake Attempts
Variable Units: N/A
Description: This parameter displays the number of attempts made to release the ratchet brake. System will fault after 2 failed attempts. (Only applies to systems equipped with ratchet brake.)

fSTS Extended:38 – Ratchet Brake Start Position (in)
Variable Units: Inches
Description: This parameter displays the captured feedback position prior to attempting to release ratchet brake. The Break Release is requested when hoist changes from no mode to Lift or Float mode.

fSTS Extended:39 – Ratchet Brake Target Position (in)
Variable Units: Inches
Description: This parameter displays the target position of ratchet brake backoff move.

fSTS Extended:40 – Spare

fSTS Extended:41 – Motor Rated Current (A)
Variable Units: Percentage
Description: This parameter displays the servo motor's rated current value.

fSTS Extended:42 – Torque Feedback (%)
Variable Units: Percentage
Description: This parameter displays the instantaneous torque feedback percentage of servo motor's rated torque.

fSTS Extended:43 – Motor Feedback Current
Variable Units: Amperes
Description: This parameter displays the instantaneous motor current reading.

fSTS Extended:44 – Drive Current Limit (Positive)
Variable Units: Amperes
Description: This parameter displays the positive current limit the drive will supply to the servo motor.

fSTS Extended:45 – Drive Current Limit (Negative)
Variable Units: Amperes
Description: This parameter displays the negative current limit the drive will supply to the servo motor.

fSTS Extended:46 – Max Float Load Cell Weight Reading (lb)
Variable Units: Pounds
Description: This parameter displays the calculated maximum weight the loadcell can read. This is based on the float load cell bias, gain, and a voltage range of ±10V.

fSTS Extended:47 – Min Float Load Cell Weight Reading (lb)
Variable Units: Pounds
Description: This parameter displays the calculated minimum weight the loadcell can read. This is based on the float load cell bias, gain, and a voltage range of ±10V.

fSTS Extended:48 – Max Encoder Reading (in)
Variable Units: Inches
Description: This parameter displays the maximum distance servo motor can travel in the positive direction before encoder rollover.

fSTS Extended:49 – Min Encoder Reading (in)
Variable Units: Inches
Description: This parameter displays the maximum distance servo motor can travel in the negative direction before encoder rollover occurs.

D. F8L1 Parameter Array

This array stores the parameters that are most frequently adjusted by the end user. This list contains parameters used to fine tune the hoist's performance. It also contains configuration parameters that must be adjusted after maintenance to the servo, motor, or gearbox or after modification of the fixture or lift handle.

These parameters are listed in the F8L1 array and can be displayed at:
KSS Workspace tree location: Knight Work Order # \ Parameters \ F8L1 \ Row xx.

Many of these parameters have equivalent displays located on various Knight Servo Studio (KSS) screens. The location of these screens is listed at the end of each parameter's description.
See section 5. 'Software' for an explanation of the shorthand used.

F8L1:00 – Spare

F8L1:01 – Float Load Cell Calibration Weight (lb)
Variable Units: Pounds
Description: This weight is used to verified the Float Load Cell Bias value.

F8L1:02 – Lift Load Cell Calibration Weight (lb)
Variable Units: Pounds
Description: This weight is used to verified the Lift Load Cell Bias value.

F8L1:03 and F8L1:04 – Spare

F8L1:05 – Upper Limit (in)
Variable Units: Inches
Description: This parameter sets the upper travel limit for the hoist. This value should be set to a number greater than or equal to zero. The home position or absolute physical top limit of the hoist's movement is set to zero inches.
KSS Workspace tree location: Knight Work Order # \ Setup \ Lift Mode Travel Limit.

F8L1:06 – Lower Limit (in)
Variable Units: Inches
Description: This parameter sets the lower travel limit for the hoist. This value should be set to the physical lowest limit of the hoist.
NOTE: All measurements increase in value as the fixture moves downward towards the ground.
KSS Workspace tree location: Knight Work Order # \ Setup \ Lift Mode Travel Limit.

F8L1:07 – Spare

F8L1:08 – Handle Weight (lb)
Variable Units: Pounds
Description: This parameter is not currently used for software calculations.

F8L1:09 – Fixture Weight (lb)
Variable Units: Pounds
Description: This parameter is used to show the static weight of all equipment hanging below the hoist's Load Monitoring Module (LMM). This equipment includes the hook, shackle, and fixture. This parameter must be adjusted if the fixture is modified or replaced.
See section 5.D. 'Check or Change Setup Values' to modify this parameter.
KSS Workspace tree location: Knight Work Order # \ Setup \ Weight Limits.

F8L1:10 – Spare

F8L1:11 – Encoder Offset (in)
Variable Units: Inches
Description: This parameter sets the offset that the hoist uses to compute its home position. It offsets the absolute encoder's zero position so the hoist's zero position becomes the position at the physical upper limit of its travel. A setting of zero indicates a non-absolute incremental motor and is only for compatibility with legacy systems. This parameter must be adjusted when the motor, gearbox or chain are replaced.
See section 5.D. 'Check or Change Setup Values' to modify this parameter.
KSS Workspace tree location: Knight Work Order # \ Setup \ Position Calibration.

F8L1:12 – Deceleration Rate at Limits (in/s²)
Variable Units: Inches per second^2
Description: This parameter sets the rate of deceleration when the hoist reaches its top and bottom limits. These limits are typically F8L1:5 'Reverse/Upper Limit (in)' and F8L1:6 'Forward/Lower Limit (in)'. The greater the number the quicker the hoist slows down when it approaches a limit.

F8L1:13 through F8L1:20 – Spare

F8L1:21 – Maximum Total Weight (lb)
Variable Units: Pounds
Description: This parameter sets the maximum load that the Servo Hoist will lift. This includes the weight of the fixture and the part.
NOTE: F8L2:21 'Max Weight Override (lb)' also restricts the maximum load that the hoist will lift. F8L1:21 must be set to a value less than or equal to the value of F8L2:21.
KSS Workspace tree location: Knight Work Order # \ Setup \ Weight Limits.

F8L1:22 – Minimum Part Weight (lb)
Variable Units: Pounds
Description: This parameter limits the load that the Servo Hoist will set down on a surface. In other words, once the weight supported by the hoist measures below this value, the Servo Hoist will not set down any more weight and hence will not pay out any more chain.
KSS Workspace tree location: Knight Work Order # \ Setup \ Weight Limits.

F8L1:23 – Lift Mode Timeout (minutes)
Variable Units: Minutes
Description: This parameter sets the length of time that the hoist will stay in Lift Mode unattended. When idle for longer than this specified time, the hoist will disable itself and revert to No Mode. If this variable is set to zero, the hoist will not switch from Lift Mode to No Mode.
KSS Workspace tree location: Knight Work Order # \ Setup \ Mode Timeouts.

F8L1:24 – Lift Mode Speed Limit (in/s)
Variable Units: Inches per second
Description: This parameter sets the maximum lift velocity for the Servo Hoist while in Lift Mode.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Handle Speed.
KSS Workspace tree location: Knight Work Order # \ Setup \ Digital Control Command.

F8L1:25 through F8L1:28 – Spare

F8L1:29 – Analog Handle Force Sense (Float) (lbf)
Variable Units: Pound Force
Description: Before the hoist switches from Float Mode to Lift Mode, this amount of force is required to be registered on a fixture or inline handle. This parameter only applies to systems that do not have a trigger that enables Lift Mode.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Handle Command.
(Note: This only appears on the page if there is No trigger configured: See Figure 5-45)

F8L1:30 – Analog Handle Force Sense (not Float) (lbf)
Variable Units: Pound Force
Description: Before the hoist switches from No Mode to Lift Mode, this amount of force is required to be registered on a fixture or inline handle. This parameter only applies to systems that do not have a trigger that enables Lift Mode.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Handle Command.
(Note: This only appears on the page if there is No trigger configured: See Figure 5-45)

F8L1:31 – Analog Handle Force Deadband (lbf)
Variable Units: Pound Force
Description: This parameter sets the amount of input force that is required to be registered on a fixture or inline handle to start motion.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Handle Command.

F8L1:32 through F8L1:35 – Spare

F8L1:36 – Digital Fast Speed (in/s)
Variable Units: Inches per second
Description: This parameter sets the maximum velocity for a hoist with discrete up/down controls. This parameter is used by the software when a digital lever is fully depressed.
Note: Applies to systems with up/down pendants or wireless transmitters only.
KSS Workspace tree location: Knight Work Order # \ Setup \ Digital Control Command.

F8L1:37 – Digital Normal Speed (in/s)
Variable Units: Inches per second
Description: This parameter sets the minimum velocity for a hoist with discrete up/down controls. This parameter is used by the software when a digital lever is only depressed half way.
Note: Applies to systems with up/down pendants or wireless transmitters only.
KSS Workspace tree location: Knight Work Order # \ Setup \ Digital Control Command.

F8L1:38 – Digital Acceleration (in/s²)
Variable Units: Inches per second^2
Description: This parameter sets the acceleration for hoists with discrete up/down controls.
Note: Applies to systems with up/down pendants or wireless transmitters only.
KSS Workspace tree location: Knight Work Order # \ Setup \ Digital Control Command.

F8L1:39 – Digital Deceleration (in/s²)
Variable Units: Inches per second^2
Description: This parameter sets the deceleration for hoists with discrete up/down controls.
Note: Applies to systems with up/down pendants or wireless transmitters only.
KSS Workspace tree location: Knight Work Order # \ Setup \ Digital Control Command.

F8L1:40 – Spare

F8L1:41 – Float Mode Upper Limit (in)
Variable Units: Inches
Description: This parameter sets the upper travel limit for the hoist when it is in Float Mode. This is used to restrict the Float Mode travel to a position greater than the overall upper limit set in F8L1:5 ‘Upper Limit (in)’.
KSS Workspace tree location: Knight Work Order # \ Setup \ Float Mode travel Limits.

F8L1:42 – Float Mode Lower Limit (in)
Variable Units: Inches
Description: This parameter sets the lower travel limit for the hoist when it is in Float Mode. This is used to restrict the Float Mode travel to a position less than the overall lower limit set in F8L1:6 ‘Lower Limit (in)’.
KSS Workspace tree location: Knight Work Order # \ Setup \ Float Mode travel Limits.

F8L1:43 – Float Mode Timeout (minutes)
Variable Units: Minutes
Description: This parameter sets the length of time that the hoist will stay in Float Mode unattended. When idle for longer than this specified time the hoist will disable and revert to No Mode. If this variable is set to zero, the hoist will not switch from Float Mode to No Mode.
KSS Workspace tree location: Knight Work Order # \ Setup \ Mode Timeouts.

F8L1:44 – Float Mode Speed Limit (in/s)
Variable Units: Inches per second
Description: This parameter sets the maximum velocity of the Servo Hoist when it is in Float Mode.
KSS Workspace tree location: Knight Work Order # \ Setup \ Float Mode Speed.

F8L1:45 – Float Mode Deadband (lbf)
Variable Units: Pound Force
Description: This parameter sets the minimum amount of force that is required to be exerted on the fixture or part hanging from the bottom of the Load Monitoring Module to start motion while the hoist is in Float Mode.
KSS Workspace tree location: Knight Work Order # \ Setup \ Float Mode Command.

F8L1:46 – Spare

F8L1:47 – Analog Pendant Speed Band Selection
Variable Units: N/A
Description: This parameter configures an analog pendant to vary speed linearly or set up to 5 different fixed speeds throughout the analog pendants command range.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Command

F8L1:48 – Analog Pendant Infinite Bands Full Speed (in/s)
Variable Units: Inches per second
Description: This parameter sets the maximum speed for analog pendant control in infinite bands mode.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Command

F8L1:49 – Analog Pendant Band 1 Speed (in/s)
Variable Units: Inches per second
Description: This parameter sets the Command speed of analog pendant while in speed band 1.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Command

F8L1:50 – Analog Pendant Band 2 Speed (in/s)
Variable Units: Inches per second
Description: This parameter sets the Command speed of analog pendant while in speed band 2.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Command

F8L1:51 – Analog Pendant Band 3 Speed (in/s)
Variable Units: Inches per second
Description: This parameter sets the Command speed of analog pendant while in speed band 3.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Command

F8L1:52 – Analog Pendant Band 4 Speed (in/s)
Variable Units: Inches per second
Description: This parameter sets the Command speed of analog pendant while in speed band 4.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Command

F8L1:53 – Analog Pendant Band 5 Speed (in/s)
Variable Units: Inches per second
Description: This parameter sets the Command speed of analog pendant while in speed band 5.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Command

F8L1:54 – Analog Pendant Acceleration (in/s²)
Variable Units: Inches per second^2
Description: This parameter sets the Acceleration rate applied to Analog Pendant control commands.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Command

F8L1:55 – Analog Pendant Deceleration (in/s²)
Variable Units: Inches per second^2
Description: This parameter sets the Deceleration rate applied to Analog Pendant control commands.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Command

F8L1:56 – Analog Pendant Minimum Voltage (V)
Variable Units: Voltage
Description: This parameter is the Minimum voltage range of Analog Pendant.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Calibration

F8L1:57 – Analog Pendant Maximum Voltage (V)
Variable Units: Voltage
Description: This parameter is the Maximum voltage range of Analog Pendant.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Calibration

F8L1:58 – Analog Pendant Bias Voltage (V)
Variable Units: Voltage
Description: This parameter is set to match the neutral voltage of the analog pendant's sensor when no operator input is applied. This is a physical property and should not be modified unless the analog pendant is replaced.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Calibration

F8L1:59 – Analog Pendant Deadband (%)
Variable Units: Percentage
Description: This parameter sets the percentage of travel around the neutral position, relative to the full travel range, before motion is commanded.
KSS Workspace tree location: Knight Work Order # \ Setup \ Analog Pendant Calibration

F8L1:60 through F8L1:77 – Spare

F8L1:78 – Slow Zone Mode (0 = off, 1 = down, 2 = up, 3 = both)
Variable Units: Choice (0=off, 1=down, 2=up, 3=up and down)
Description: This parameter configures the hoist's automatic slow zone.
This parameter works with the variables F8L1:79 to F8L1:84 to configure the automatic slow zone.
0 = Slow Zone feature is disabled.
1 = Program will automatically decrease the speed of the hoist only when moving down.
2 = Program will automatically decrease the speed of the hoist only when moving up.
3 = Program will automatically decrease the speed of the hoist when moving up or down.
KSS Workspace tree location: Knight Work Order # \ Setup \ Slow Zone.
NOTE: If using this function, all parameters (F8L1:79 to F8L1:84) must be non-zero for the Slow Zone to function correctly.

F8L1:79 – Slow Zone Part Loaded Weight (lb)
Variable Units: Pounds
Description: This parameter sets the number of pounds that the hoist needs to register in order to indicate that a part is loaded on the fixture.
This parameter is only processed if the Slow Zone is turned on, i.e., F8L1:78 'Slow Zone Mode' is not zero.
KSS Workspace tree location: Knight Work Order # \ Setup \ Slow Zone.

F8L1:80 – Slow Zone Part Loaded Position (in)
Variable Units: Inches
Description: This parameter sets the height that the hoist will start to run at a reduced speed when a part is loaded.
This parameter is only processed if the Slow Zone is turned on, i.e., F8L1:78 'Slow Zone Mode' is not zero.
NOTE: The current position of the hoist is visible in fSTS: 30 "Real World Position" or on the KSS Home screen location: Quick View panel \ Row 5 (Lower right-hand portion of the screen).
KSS Workspace tree location: Knight Work Order # \ Setup \ Slow Zone.

F8L1:81 – Slow Zone Part Loaded Speed (in/s)
Variable Units: Inches per second
Description: This parameter sets the reduced speed that the hoist runs at when a part is loaded and it is below the F8L1:80 'Slow Zone Part Loaded Position' parameter.
This parameter is only processed if the Slow Zone is turned on, i.e., F8L1:78 'Slow Zone Mode' is not zero.
KSS Workspace tree location: Knight Work Order # \ Setup \ Slow Zone.

F8L1:82 – Slow Zone Part Unloaded Position (in)
Variable Units: Inches
Description: This parameter sets the height that the hoist will start to run at a reduced speed when a part is not loaded. This is only valid if the Slow Zone is turned on, i.e., F8L1:78 'Slow Zone Mode' is not zero.
KSS Workspace tree location: Knight Work Order # \ Setup \ Slow Zone.

F8L1:83 – Slow Zone Part Unloaded Speed (in/s)
Variable Units: Inches per second
Description: This parameter sets the reduced speed that the hoist runs at when a part is not loaded and it is below the F8L1:82 'Slow Zone Part Unloaded Position' parameter.
This parameter is only processed if the Slow Zone is turned on, i.e., F8L1:78 'Slow Zone Mode' is not zero.
KSS Workspace tree location: Knight Work Order # \ Setup \ Slow Zone.

F8L1:84 – Slow Zone Entry Deceleration (in/s²)
Variable Units: Inches per second^2
Description: This parameter sets the deceleration constant when the hoist approaches the slow zone and transitions from the normal speed to the reduced speed.
This parameter is only processed if the Slow Zone is turned on, i.e., F8L1:78 'Slow Zone Mode' is not zero.
KSS Workspace tree location: Knight Work Order # \ Setup \ Slow Zone.

F8L1:85 – Slow Zone Invert
Variable Units: Boolean (0=Off, 1=On)
Description: The slow zone usually is only initiated when the hoist is Below the slow zone heights.
This parameter changes the functionality of the slow zone so that it initiates when the hoist is Above the stated heights.
KSS Workspace tree location: Knight Work Order # \ Setup \ Slow Zone.

F8L1:86 through F8L1:255 – Spare

E. User Retained Variables Parameter Array

This array displays all of the user retained variables for the hoist.

These parameters are listed in the User Retained Variables array and can be displayed at:
KSS Workspace tree location: Knight Work Order # \ User Program \ UserRetainVars \ Row xx

UserRetainVars:00 through UserRetainVars:4096 – Spare
Variable Units: Varies
Description: These parameters are used for Job Specific applications.
Please see the Job Specific Manual Addendum for any application specific parameters.

F. F8L2 Parameter Array

This array stores advanced parameters that affect the performance of the hoist. These parameters should only be adjusted with the aid of a Knight Representative.

These parameters are listed in the F8L2 array and can be displayed at:
KSS Workspace tree location: Knight Work Order # \ Parameters \ F8L2 \ Row xx.

Many of these parameters have equivalent displays located on various Knight Servo Studio (KSS) screens. The location of these screens is listed at the end of each parameter's description.
See section 5. 'Software' for an explanation of the shorthand used.

WARNING

ALL variables in the F8L2 parameter list should NOT be manipulated without the aid of a Knight representative.

F8L2:00 through F8L2:02 – Spare

F8L2:03 – Reverse Encoder Direction
Variable Units: Boolean (0=Off, 1=On)
Description: This parameter sets the forward direction of the encoder. This is a physical property and should not be modified.
KSS Workspace tree location: Knight WO# \ Setup \ Mechanical (Knight Password ONLY).

F8L2:04 – Spare

F8L2:05 – Gear Ratio
Variable Units: Integer
Description: This parameter states the gear ratio of the gear reducer. This is a physical property and should not be modified.
KSS Workspace tree location: Knight WO# \ Setup \ Mechanical (Knight Password ONLY).

F8L2:06 – Spare

F8L2:07 – Lift Load Cell Gain (lb/V)
Variable Units: Pounds per Volt
Description: This parameter states the gain of the lift load cell. This is a physical property and should not be modified.
KSS Workspace tree location: Knight WO# \ Setup \ Analog Handle Calibration.

F8L2:08 – Float Load Cell Gain (lb/V)
Variable Units: Pounds per Volt
Description: This parameter states the gain of the float load cell. This is a physical property and should not be modified.
KSS Workspace tree location: Knight WO# \ Setup \ Float Load Cell Calibration.

F8L2:09 – Lift Load Cell Bias (V)
Variable Units: Volts
Description: This parameter states the value of the lift load cell's analog input when there is no external force exerted on the handle. This is a physical property and should not be modified unless the fixture or inline handle is replaced.
KSS Workspace tree location: Knight WO# \ Setup \ Analog Handle Calibration.

F8L2:10 – Float Load Cell Bias (V)
Variable Units: Volts
Description: This parameter states the value of the float load cell's analog input when there is no external weight hanging from the Load Monitoring Module (LMM). This is a physical property and should not be modified unless the LMM is replaced.
KSS Workspace tree location: Knight WO# \ Setup \ Float Load Cell Calibration.

F8L2:11 – Reverse Motor Direction
Variable Units: Boolean (0=Off, 1=On)
Description: This parameter sets the direction of the servo motor. This is a physical property of the servo motor and should not be modified.
KSS Workspace tree location: Knight WO# \ Setup \ Mechanical (Knight Password ONLY).

F8L2:12 – Spare

F8L2:13 – Max Velocity Following Error (in/s)
Variable Units: Inches per second
Description: This parameter sets the maximum acceptable amount of following error allowable by the hoist. This is used by the controller for detecting a velocity following error which generates a fault number of 104.

F8L2:14 – Chain Pitch (mm)
Variable Units: Millimeters
Description: This parameter states the pitch or length of each chain link. This is a physical property and should not be modified.
KSS Workspace tree location: Knight WO# \ Setup \ Mechanical (Knight Password ONLY).

F8L2:15 – Chain Links per Revolution
Variable Units: Number of Chain Links Per Rev
Description: This parameter states the size of the drive sprocket. This is a physical property and should not be modified.
KSS Workspace tree location: Knight WO# \ Setup \ Mechanical (Knight Password ONLY).

F8L2:16 – Fault Decel Rate (in/s²)
Variable Units: Inches per second^2
Description: This parameter sets the deceleration rate of the hoist when a fault occurs. The minimum setting for this is 50in/s^2.

F8L2:17 – Lift Mode Allow Down Full Speed
Variable Units: Boolean (0=Off, 1=On)
Description: Setting this parameter to a 1 (or On) allows the hoist to travel at its maximum speed when lowering its load in Lift Mode. This speed is dynamically limited by the load weight when moving upwards in Lift Mode. Setting this to a 0 (or Off) dynamically limits the speed when lifting and lowering in Lift Mode.
KSS Workspace tree location: Knight WO# \ Feature Switchboard

F8L2:18 – Hard Stop Home Position (in)
Variable Units: Inches
Description: This parameter displays the "real world" position after accepting a value by pressing the 'SET HOME POSITION' button on the 'POSITION CALIBRATION' screen.
KSS Workspace tree location: Knight WO# \ Setup \ Position Calibration

F8L2:19 – Spare

F8L2:20 – Lift Mode Enable
Variable Units: Boolean (0=Off, 1=On)
Description: This parameter is used to enable or disable Lift Mode.
KSS Workspace tree location: Knight WO# \ Setup \ Feature Switchboard.

F8L2:21 – Spare

F8L2:22 – Up Stop Resume Bandwidth (lb)
Variable Units: Pounds
Description: *Reserved for internal use only.*

F8L2:23 – Down Stop Resume Bandwidth (lb)
Variable Units: Pounds
Description: *Reserved for internal use only.*

F8L2:24 – Up/Down Stop Resume Time (ms)
Variable Units: Milliseconds
Description: *Reserved for internal use only.*

F8L2:25 – Max Speed With No Load (in/s)
Variable Units: Factor
Description: This factor is multiplied by F8L1:24 'Lift Mode Speed Limit (in/s)' to obtain the maximum lift speed of the hoist. This value is normally a one. Any value above one will increase the hoist's maximum speed and any value below one will reduce the hoist's maximum speed.

F8L2:26 – Max Speed With Rated Load (in/s)
Variable Units: Inches per second
Description: Sets the maximum speed in Lift Mode while loaded with the rated capacity of the hoist. Weight-based speed limiting applies a linear ramp between this parameter and F8L2:25 Max Speed With No Load (in/s).

F8L2:27 – Impulse Limiting Enable
Variable Units: Boolean (0=Off, 1=On)
Description: This parameter is used to enable the hoist's impulse limiting code. When this code is enabled, the hoist will sense an instantaneous increase in weight registered by the float load cell and slow the hoist to reduce the impact on the system. Instead of suddenly moving the load upwards, the hoist senses the impulse and automatically slows down to a controlled speed.
KSS Workspace tree location: Knight WO# \ Setup \ Feature Switchboard.

F8L2:28 – Impulse Limiting Max Speed (in/s)
Variable Units: Inches per second
Description: This parameter sets the speed that the hoist will slow to when impulse limiting is enabled and a sudden movement is detected.
KSS Workspace tree location: Knight WO# \ Tuning \ Impulse Limiting (Knight Password ONLY).

F8L2:29 – Impulse Limiting Max Speed Time (ms)
Variable Units: Seconds
Description: This parameter sets the duration that the slow speed will be active when impulse limiting is enabled and a sudden movement is detected.
KSS Workspace tree location: Knight WO# \ Tuning \ Impulse Limiting (Knight Password ONLY).

F8L2:30 – Analog Handle Enable
Variable Units: Boolean (0=Off, 1=On)
Description: This parameter is used to enable an analog handle. This parameter is enabled for systems that have an inline or fixture handle.
KSS Workspace tree location: Knight WO# \ Setup \ Feature Switchboard.

F8L2:31 – Analog Handle Filter Bandwidth
Variable Units: Frequency
Description: This parameter controls how quickly the hoist responds to force changes on the lift load cell. The larger the number the faster the hoist reacts to changes in force applied to the analog handle.

F8L2:32 – Trigger Release Deceleration (in/s²)
Variable Units: Inches per second^2
Description: *Reserved for internal use only.*

F8L2:33 – Analog Handle Acceleration (in/s²)
Variable Units: Inches per second^2
Description: *Reserved for internal use only.*

F8L2:34 – Analog Handle Deceleration (in/s²)
Variable Units: Inches per second^2
Description: *Reserved for internal use only.*

F8L2:35 – Lift Load Cell Force Limit (lb)
Variable Units: Pounds
Description: This parameter sets the maximum lift command that can be given to the hoist via an analog handle without generating a fault. For example, if this parameter is set to 100lbs and a force of more than 100lbs is applied to the handle while the hoist is in Lift Mode then the software will generate a fault.

F8L2:36 – Lift Cancel Gain
Variable Units: Real Number
Description: This parameter controls how much of the force registered on the lift load cell is subtracted from the force seen on the float load cell when using a fixture handle.

F8L2:37 – Spare

F8L2:38 – Digital Control Enable
Variable Units: Boolean (0=Off, 1=On)
Description: This parameter is used to enable a digital handle. This parameter is enabled for systems that have a single-speed or two-speed pushbutton control handle or a wireless transmitter pendant.
KSS Workspace tree location: Knight WO# \ Setup \ Feature Switchboard.

F8L2:39 – Analog Pendant Enable
Variable Units: Boolean (0=Off, 1=On)
Description: This parameter is used to enable or disable the analog pendant.
KSS Workspace tree location: Knight WO# \ Setup \ Feature Switchboard.

F8L2:40 – Float Mode Enable
Variable Units: Boolean (0=Off, 1=On)
Description: This parameter is used to enable or disable Float Mode.
KSS Workspace tree location: Knight WO# \ Setup \ Feature Switchboard.

F8L2:41 through F8L2:44 – Spare

F8L2:45 – Float Mode Max Speed Scale Factor
Variable Units: Factor
Description: This factor is multiplied by F8L1:44 'Float Mode Speed Limit (in/s)' to obtain the maximum speed of the hoist while it is in Float Mode. This value is normally a one. Any value above one will increase the hoist's maximum speed and any value below one will reduce the hoist's maximum speed.

F8L2:46 through F8L2:49 – Spare

F8L2:50 – "In Position" Position Window
Variable Units: Inches
Description: *Reserved for internal use only.*

F8L2:51 and F8L2:52 – Spare

F8L2:53 – Float Acceleration (in/s²)
Variable Units: Inches per second^2
Description: *Reserved for internal use only.*

F8L2:54 – Float Deceleration (in/s²)
Variable Units: Inches per second^2
Description: *Reserved for internal use only.*

F8L2:55 – Float Command Force Limit (lb)
Variable Units: Pounds
Description: This parameter sets the maximum float command that can be given to the hoist without generating a fault. For example, if this parameter is set to 100lbs and a force of more than 100lbs is applied to the fixture or part while the hoist is in Float Mode then the software will generate a fault.

F8L2:56 through F8L2:59 – Spare

F8L2:60 – Float Proportional Gain Scale Factor
Variable Units: Real Number
Description: This parameter sets the target velocity per unit of force exerted on the float load cell while the hoist is in Float Mode.
KSS Workspace tree location: Knight WO# \ Setup \ Float Mode Tuning (Advanced Password Required).

F8L2:61 – Float Filter Scale Factor
Variable Units: Real Number
Description: This parameter sets how quickly the force applied to the load suspended from the Load Monitoring Module changes the float command velocity.
KSS Workspace tree location: Knight WO# \ Setup \ Float Mode Tuning (Advanced Password Required).

F8L2:62 – Spare

F8L2:63 – Float Force Filter Trim Scale Factor
Variable Units: Real Number
Description: This parameter allows the hoist to respond quicker to a float motion input command. The higher the value, the easier it is to begin movement of the hoist while it is in Float Mode.
KSS Workspace tree location: Knight WO# \ Setup \ Float Mode Tuning (Advanced Password Required).

F8L2:64 – Max Speed for Jerk Limiting (in/s)
Variable Units: Inches per second
Description: This parameter controls the maximum velocity the hoist can be travelling at and still reset the "Hit Ground" bit while it is in Float Mode.

F8L2:65 – Disable Gear Unlock Code
Variable Units: Real Number
Description: When this parameter is enabled, it limits the initial maximum velocity of Float Mode. When the hoist slows below the speed listed in F8L3[68] 'Gear Unlock Feedback Velocity (ips)', then the software will prevent any increase in speed over F8L3[67] 'Gear Unlock Command Velocity (ips)' for the amount of time in F8L3[69] 'Gear Unlock Time (ms)'. After this delay, the hoist is allowed to ramp up towards its commanded velocity.

F8L2:66 – Spare

F8L2:67 – Enable Accelerometer
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:68 – Accelerometer Gain (g/V)
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:69 and F8L2:70 – Spare

F8L2:71 – Enable Stress Relief Logic
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:72 – Spare

F8L2:73 – Polynomial Weight Correction Factor 6
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:74 – Polynomial Weight Correction Factor 5
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:75 – Polynomial Weight Correction Factor 4
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:76 – Polynomial Weight Correction Factor 3
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:77 – Polynomial Weight Correction Factor 2
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:78 – Polynomial Weight Correction Factor 1
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:79 – Polynomial Weight Correction Factor 0
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:80 – Touch Filter Bandwidth (rad/s)
Variable Units: Real Number
Description: This parameter controls how quickly the system triggers a Down Stop or Up Stop in response to exceeding the minimum or maximum weight. The larger the number the more quickly the hoist responds.

F8L2:81 – Steady Weight Filter Constant
Variable Units: Real Number
Description: This parameter controls how quickly the "Steady Part Weight" value changes in response to changes in float load cell force. The larger the number the more quickly the hoist responds.

F8L2:82 – Spare

F8L2:83 – Active Damping Filter Constant (Low Frequency)
Variable Units: Real Number
Description: This parameter is used in conjunction with F8L2:86 'Active Damping Gain (LF)' to prevent low frequency oscillations occurring at the control handle.
KSS Workspace tree location: Knight WO# \ Tuning \ Active Dampening.

F8L2:84 – Spare

F8L2:85 – Active Damping Filter Constant (High Frequency)
Variable Units: Real Number
Description: This parameter is used in conjunction with F8L2:87 'Active Damping Gain (HF)' to prevent high frequency oscillations occurring at the control handle.
KSS Workspace tree location: Knight WO# \ Tuning \ Active Dampening.

F8L2:86 – Active Damping Gain (Low Frequency)
Variable Units: Real Number
Description: This parameter is used in conjunction with F8L2:83 'Active Damping Filter Constant (LF)' to prevent low frequency oscillations occurring at the control handle.
KSS Workspace tree location: Knight WO# \ Tuning \ Active Dampening.

F8L2:87 – Active Damping Gain (High Frequency)
Variable Units: Real Number
Description: This parameter is used in conjunction with F8L2:85 'Active Damping Filter Constant (HF)' to prevent high frequency oscillations occurring at the control handle.
KSS Workspace tree location: Knight WO# \ Tuning \ Active Dampening.

F8L2:88 and F8L2:89 – Spare

F8L2:90 – Active Damping Min Gain (Lift)
Variable Units: Real Number
Description: This parameter sets the lowest point the velocity-based ramp-down multiplier can reach. This is only valid for Lift Mode.
KSS Workspace tree location: Knight WO# \ Tuning \ Active Dampening.

F8L2:91 – Active Damping Min Gain (Float)
Variable Units: Real Number
Description: This parameter sets the lowest point the velocity-based ramp-down multiplier can reach. This is only valid for Float Mode.
KSS Workspace tree location: Knight WO# \ Tuning \ Active Dampening.

F8L2:92 – Active Damping Always On
Variable Units: Boolean (0=Off, 1=On)
Description: This parameter controls whether or not the low frequency Active Damping velocity is ramped down based on velocity. If the value is a one (or On), the hoist will only control the ramp function while it is moving down towards the ground. If the value is a zero (or Off), it will control the velocity in both directions.
KSS Workspace tree location: Knight WO# \ Setup \ Feature Switchboard.

F8L2:93 – Active Damping Ramp Down Start Position (in)
Variable Units: Inches
Description: This parameter sets the point at which the active damping velocity starts to ramp down based on position.
KSS Workspace tree location: Knight WO# \ Tuning \ Active Dampening.

F8L2:94 – Active Damping Ramp Down Min Gain Position (in)
Variable Units: Inches
Description: This parameter sets the point at which the position-based ramp reaches its minimum multiplier value.
KSS Workspace tree location: Knight WO# \ Tuning \ Active Dampening.

F8L2:95 – Active Damping Ramp Down Min Gain
Variable Units: Real Number
Description: This parameter sets the lowest point the position-based ramp-down multiplier can reach.
KSS Workspace tree location: Knight WO# \ Tuning \ Active Dampening.

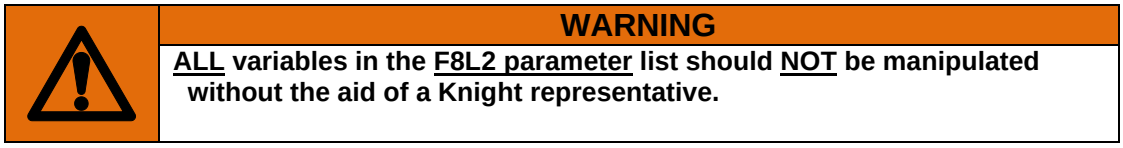
F8L2:96 – Enable Low Frequency Active Damping Notch Filter
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:97 – Enable High Frequency Active Damping Notch Filter
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:98 – 2nd Float LC Gain (lb/V)
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:99 – 2nd Float LC Bias (V)
Variable Units: *Reserved for internal use only.*
Description: *Reserved for internal use only.*

F8L2:100 through F8L2:255 – Spare



7. TROUBLESHOOTING

There are several troubleshooting screens described in this section:

7.A.) Troubleshooting Screens
7.B.) System Activity screens including Faults, Warnings and Error Codes
7.C.) Troubleshooting Inputs and Outputs
7.D.) Troubleshooting Chart

A. Troubleshooting Screens

There are several Troubleshooting screens covered in this section. Each of these screens is listed below and can be accessed inside the Knight Servo Studio (KSS) software from:
KSS Workspace tree location: Knight Work Order # \ Troubleshooting \ …

7a) Network Connection
7b) Solid Red Light screen
7c) Solid Green Light screen
7d) Solid Blue Light screen
7e) Solid Green/Blue Lights screen
7f) Slow Flashing Red Light screen
7g) Fast Flashing Red Light screen
7h) Flashing Green Light screen
7i) Alternating Red / Green Lights screen
7j) Other Light Patterns screen
7k) Can’t Enter Lift Mode screen
7l) Can’t Enter Float Mode screen
7m) Can't Move Up (Reverse) screen
7n) Can't Move Down (Forward) screen
7o) Unexpected Motion screen
7p) Safety Relay screen

See section 5. ‘Software’ for an explanation of the shorthand used.

7a) Network Connection screen

This screen lists the steps to troubleshoot your laptop's network connection. (Refer to Figure 7-1)

In section (I), if there is a network connection problem, follow the steps below.

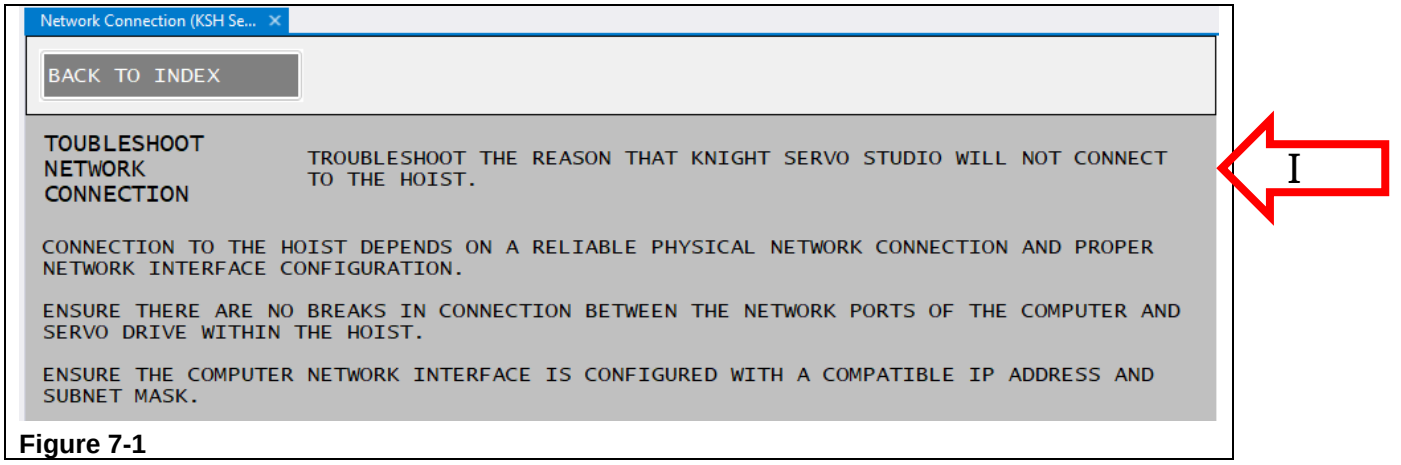


Figure 7-1

7b) Solid Red Light screen

This screen lists the reasons why the red light is on in a solid condition. (Refer to Figure 7-2)

In section (I), if the banner is green, there are no program faults.
If it is red, press the "INVESTIGATE PROGRAM ALARMS" button to examine the fault.
In section (II), if the banner is green, the STO circuit is operating correctly.
If it is red, press the "INVESTIGATION SAFETY RELAY" button to diagnose the problem.

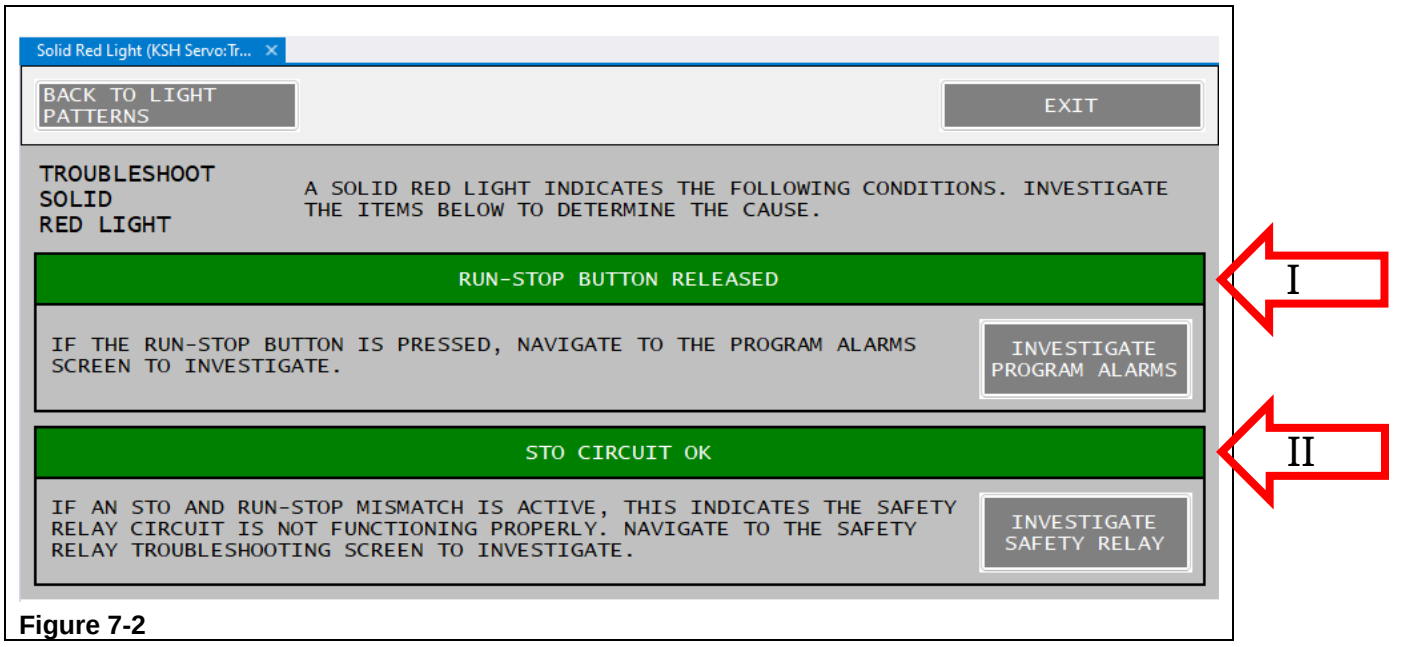


Figure 7-2

7c) Solid Green Light screen

This screen lists the reasons why the green light is on in a solid condition. (Refer to Figure 7-3)

In section (I), if this banner is green, the hoist is in lift mode.

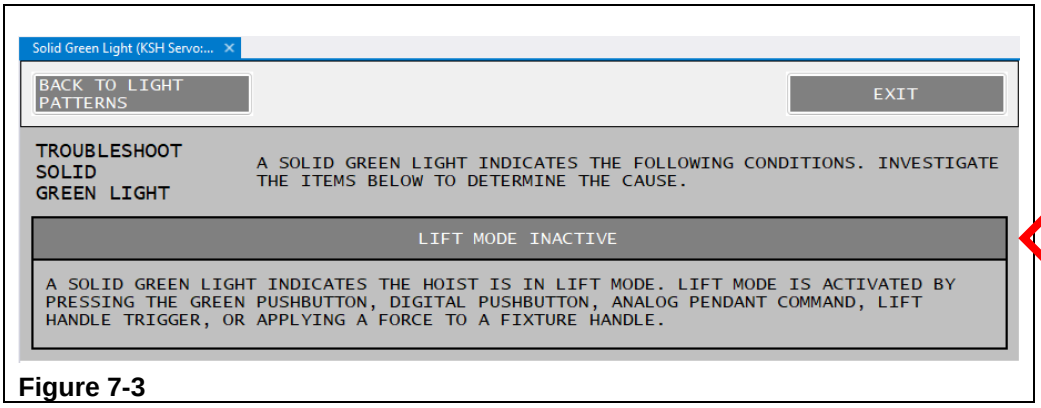


Figure 7-3

7d) Solid Blue Light screen

This screen lists the reasons why the blue light is on in a solid condition. (Refer to Figure 7-4)

In section (I), if this banner is green, the hoist is in float mode.

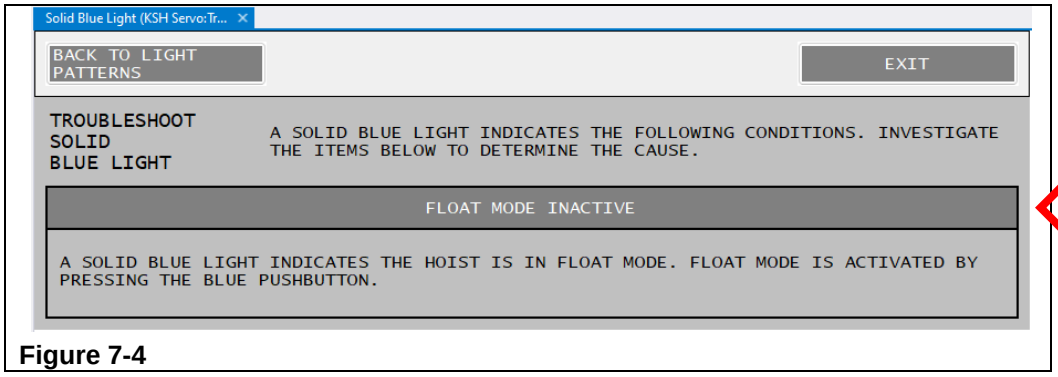


Figure 7-4

7e) Solid Green/Blue Light screen

This screen lists the reasons why the blue light is on in a solid condition. (Refer to Figure 7-5)

In section (I), if this banner is green, the hoist is in payout mode.
If it is red, press the “INVESTIGATE PAYOUT MODE” button to examine the function.

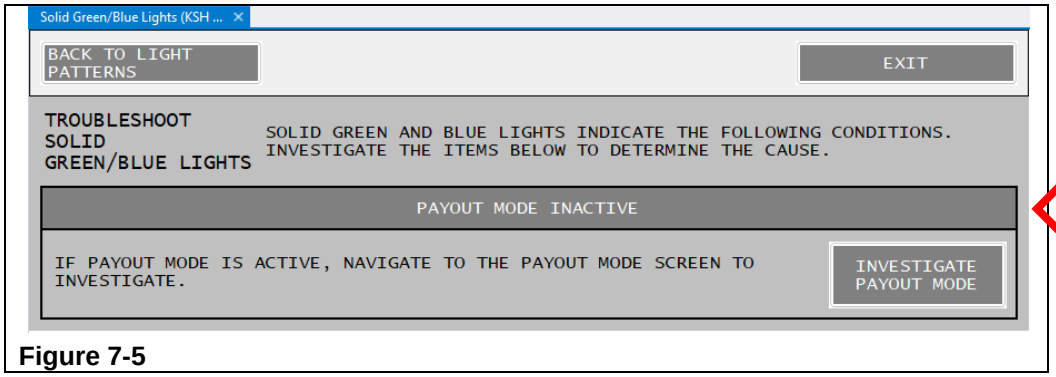


Figure 7-5

7f & 7g) Slow and Fast Flashing Red Light screens

This screen lists the steps to trace down the reason why the hoist's red fault light is flashing. (Refer to Figure 7-6)

In section (I), if the indicator box is red then either a Fault or Warning is Active.
If the hoist's red light is flashing, match the speed of the flash: Slow or Fast.
Click on the corresponding picture.
In section (II), a slow flashing light indicates a Warning. Press the correct button to investigate a Drive or Program warning.
In section (III), a fast-flashing light indicates a Fault. Press the correct button to investigate a Drive or Program warning.

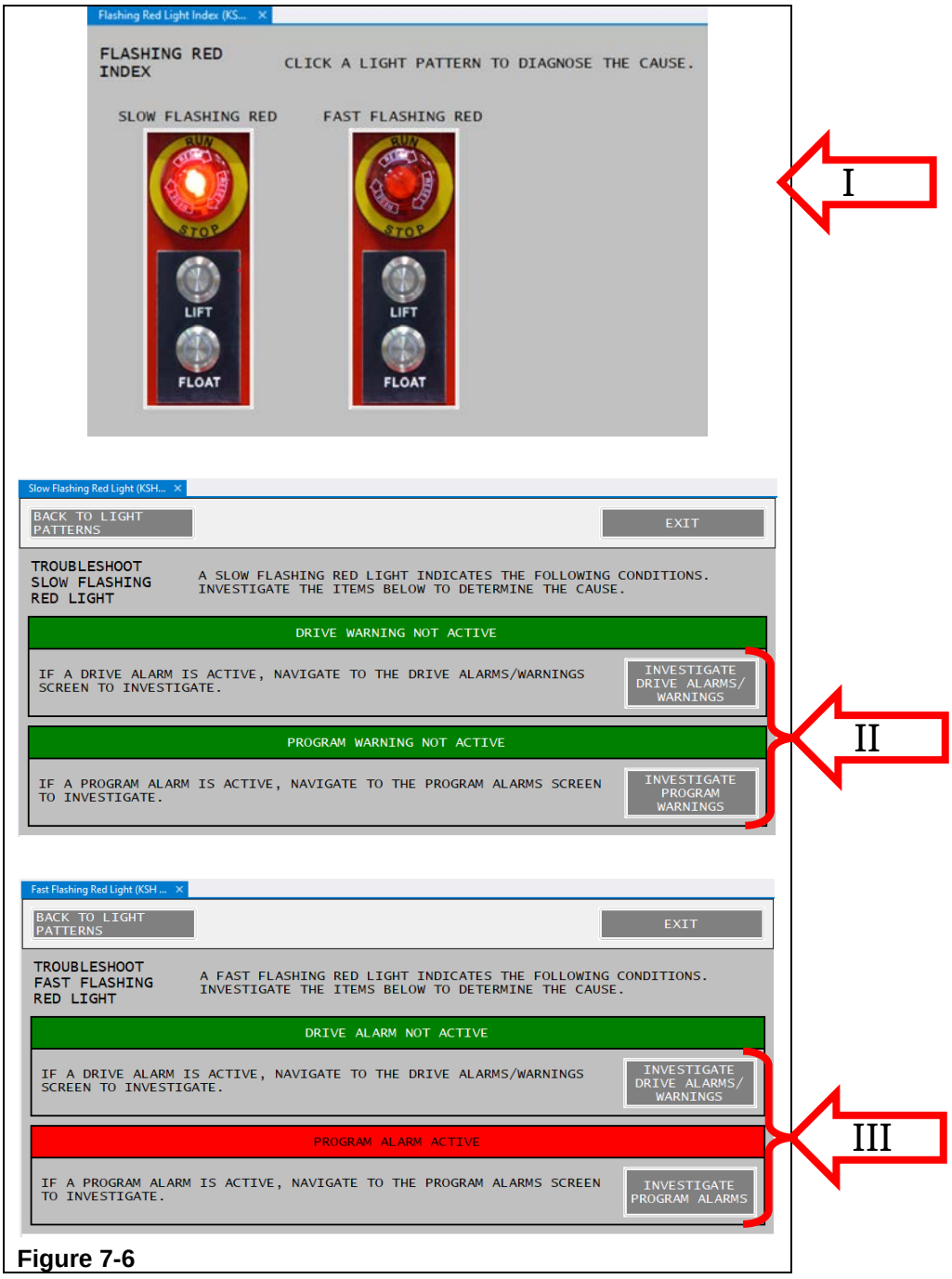


Figure 7-6

7h) Flashing Green Light screen

This screen lists the steps to trace down the reason why the hoist's green light is flashing.

This green light is customarily referred to as the 'Lift Mode light' because it is normally illuminated during Lift Mode. (Refer to Figure 7-7)

In section (I), click the picture to bring up the troubleshooting screen.

If the hoist's green light is flashing, follow the steps listed on the screen below.

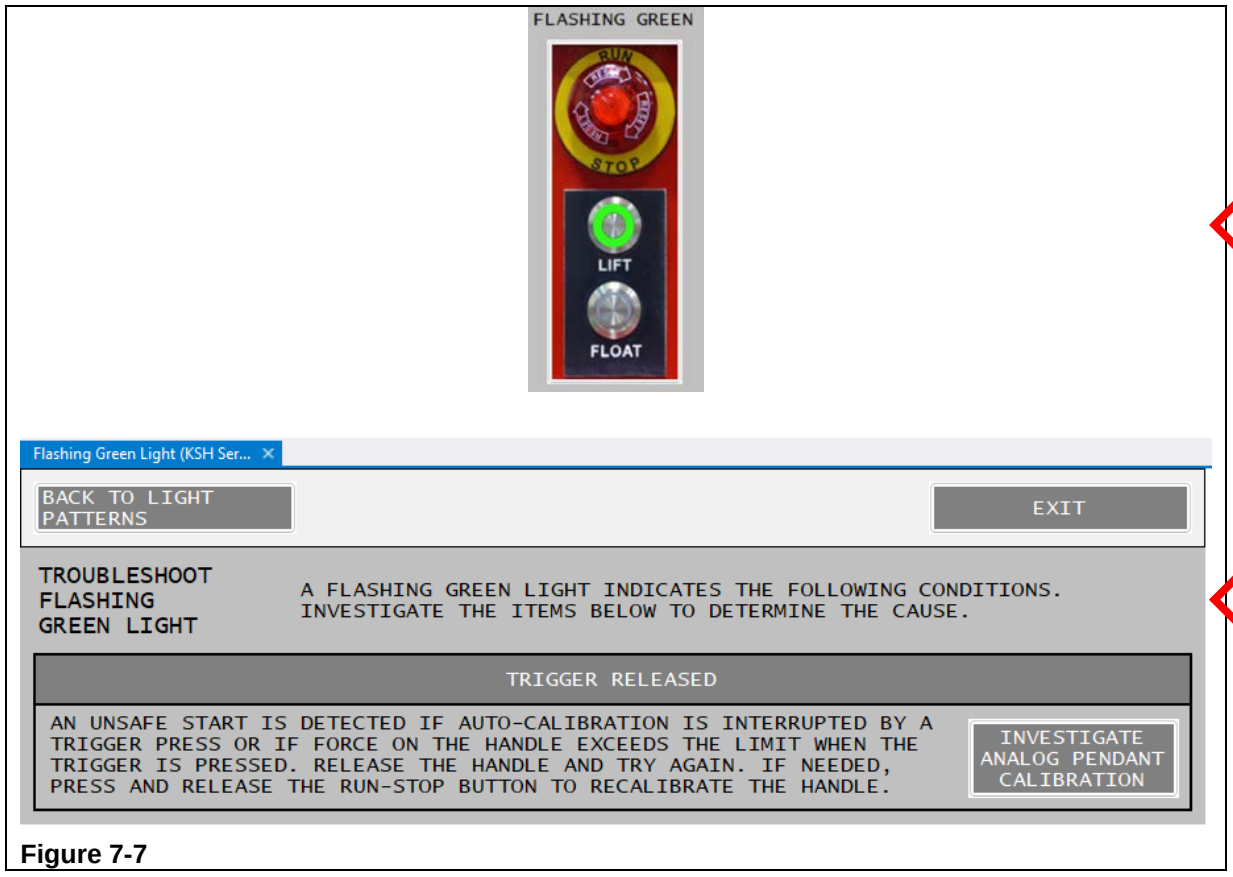


Figure 7-7

7i) Alternating Red / Green Lights screen

This screen lists the steps to diagnose when the Red and Green lights are alternatively flashing.

In section (I), follow the instructions below. (Refer to Figure 7-8)

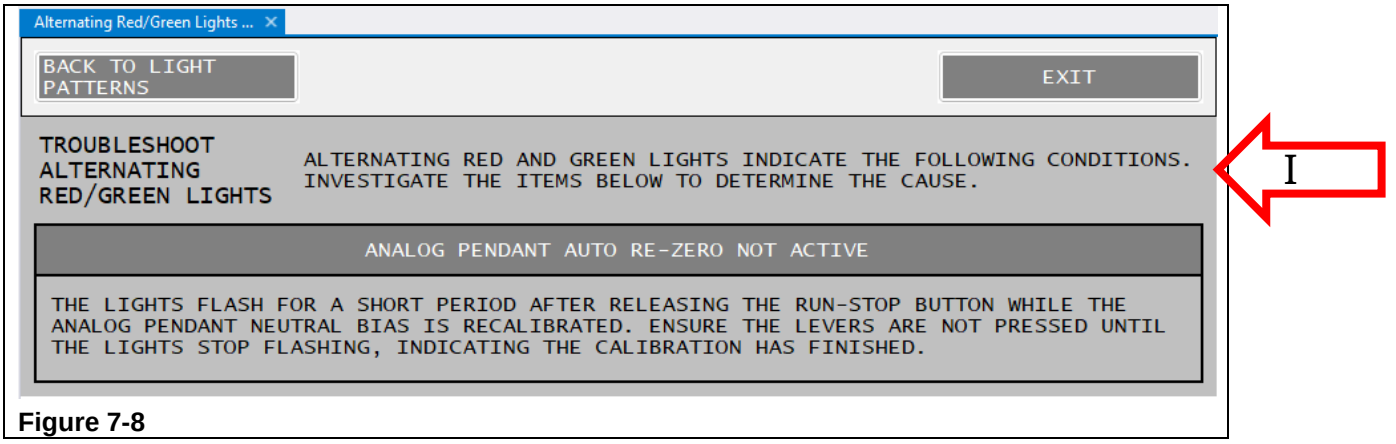


Figure 7-8

7j) Other Light Patterns screen

This screen lists the steps to diagnose when any other light pattern is displayed.

In section (I), follow the instructions below. (Refer to Figure 7-9)

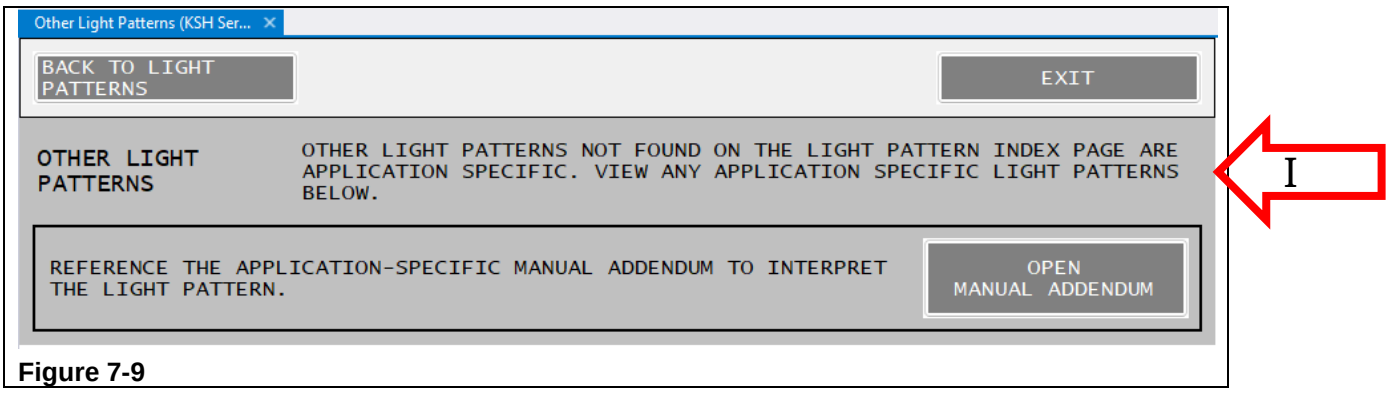


Figure 7-9

7k) Can't Enter Lift Mode screen

This screen lists the steps to trace down the reason why the hoist will not enter Lift Mode.

In section (I), if the indicator box is green then the system is in Lift Mode, but if the indicator box is red then the system is NOT in Lift Mode.

If the hoist will not enter Lift Mode, ensure all the conditions listed on the screen below are met. (Refer to Figure 7-10)

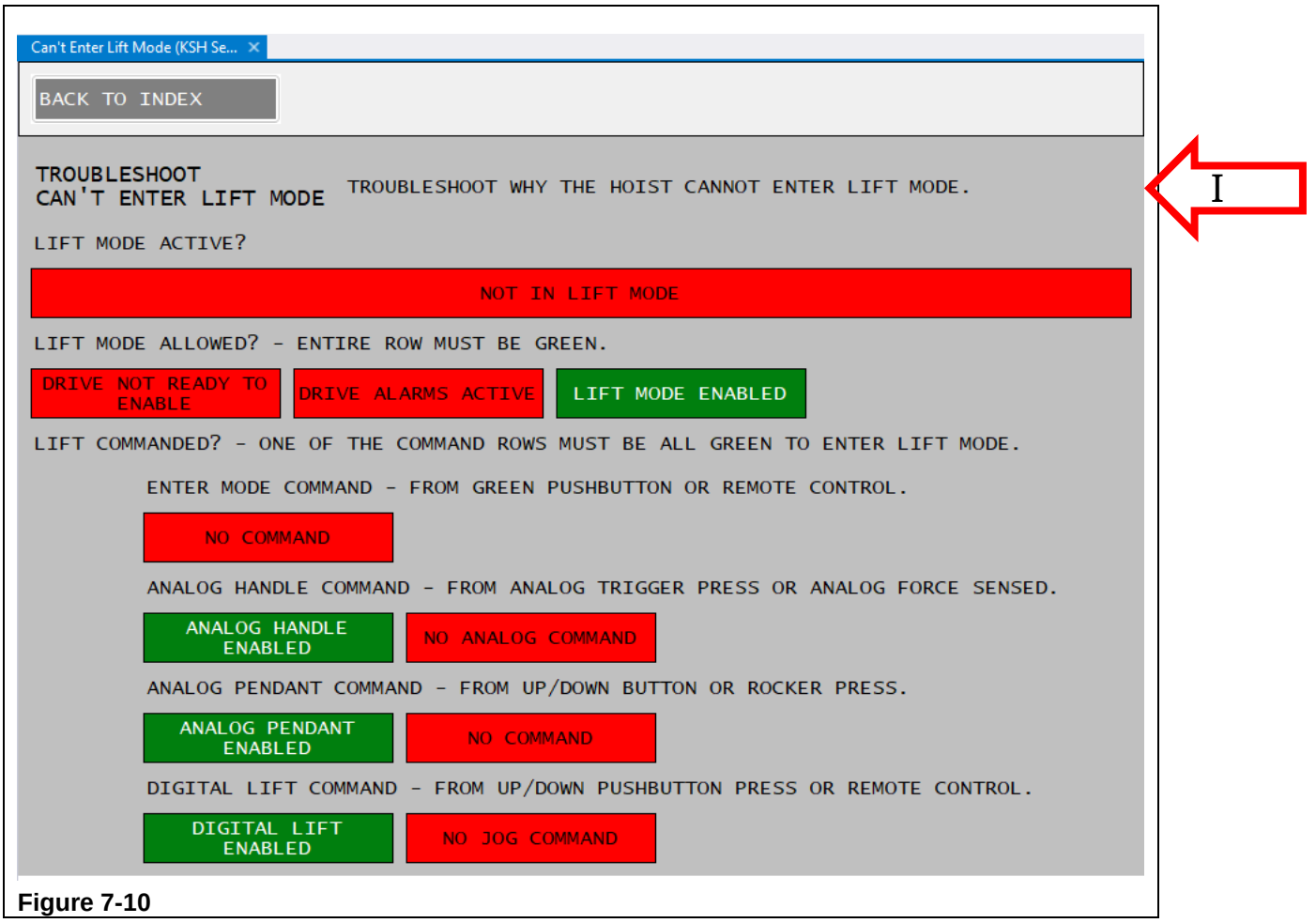


Figure 7-10

7I) Can't Enter Float Mode screen

This screen lists the steps to trace down the reason why the hoist will not enter Float Mode.

In section (I), if the indicator box is green then the system is in Float Mode, but if the indicator box is red then the system is NOT in Float Mode.

If the hoist will not enter Float Mode, ensure all the conditions listed on the screen below are met. (Refer to Figure 7-11)

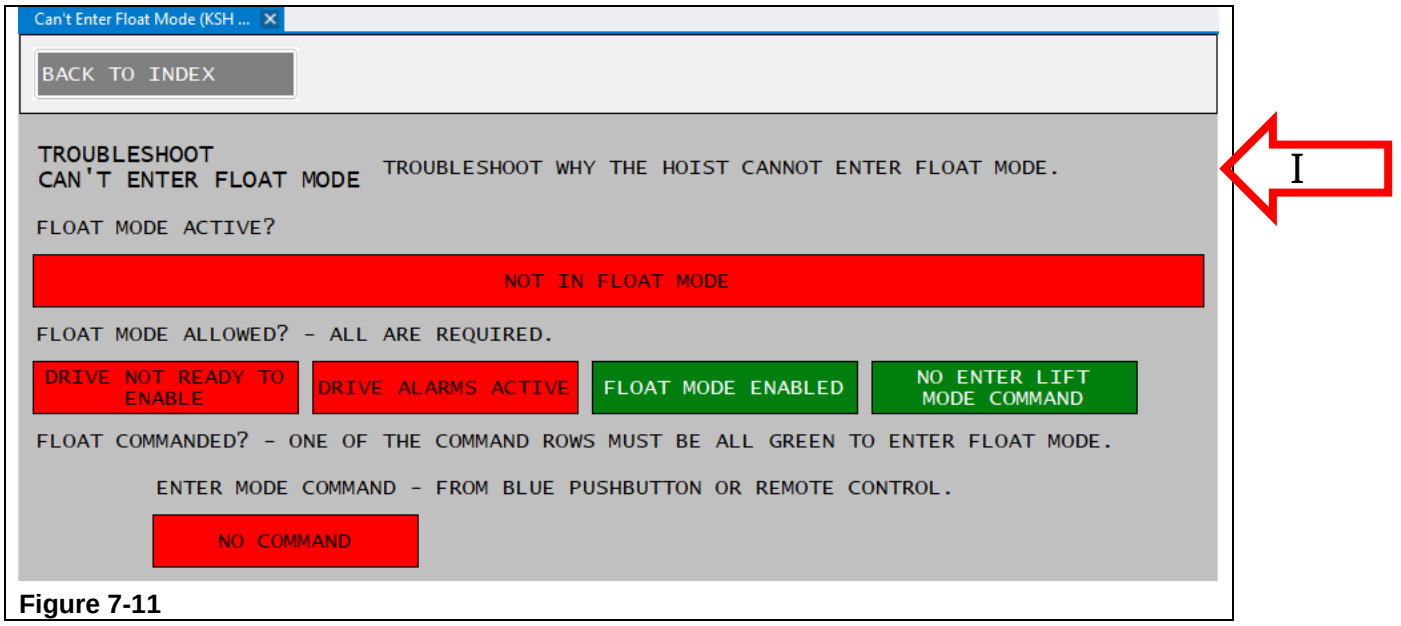


Figure 7-11

7m) Can't Move Up (Reverse) screen

This screen lists the steps to trace down the reason why the hoist won't move upwards towards the bottom of the servo.

In section (I), if the indicator box is green then the function is on, but if the indicator box is grey then the function is off.
In section (II), the current measured weight is shown as well as the maximum weight the hoist will lift.
In section (III), the current position is shown as well as the upper limit of the hoist.
In section (IV), both load cell voltages are shown in real time.
NOTE: If the hoist only has a digital up/down control handle, the 'Lift LC Voltage' will be zero.
In section (V), if the indicator box is red then the hoist's Up Stop is active, but if it is grey the hoist's Up Stop is off. If the Up Stop is ACTIVE then the software is preventing the hoist from moving up.

If the hoist won't move up, ensure all of the conditions listed on the screen below are met. (Refer to Figure 7-12)

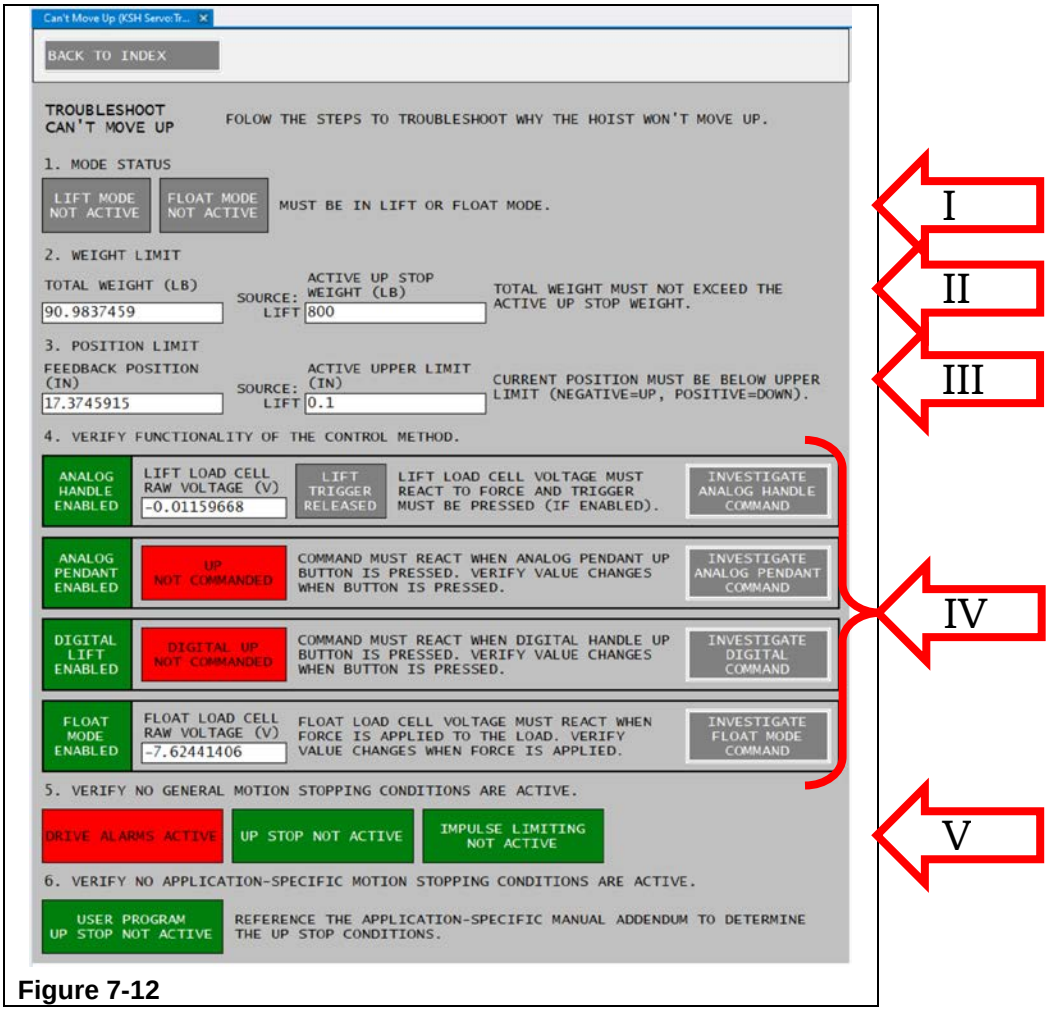


Figure 7-12

7n) Can't Move Down (Forward) screen

This screen lists the steps to trace down the reason why the hoist won't move down towards the facilities' floor.

In section (I), if the indicator box is green then the function is on, but if the indicator box is grey then the function is off.
In section (II), the current measured weight is shown as well as the total weight that the hoist will set down on a surface.
In section (III), the current position is shown as well as the lower limit of the hoist.
In section (IV), both load cell voltages are shown in real time.
NOTE: If the hoist only has a digital up/down control handle, the 'Lift LC Voltage' will be zero.
In section (V), if the indicator box is red then the hoist's Down Stop is active, but if it is grey the hoist's Down Stop is off. If the Down Stop is active then the software is preventing the hoist from moving down.

If the hoist won't move down ensure all of the conditions listed on the screen below are met.
(Refer to Figure 7-13)

KSS Workspace tree location: Knight WO# \ Troubleshooting \ Can't Move Down

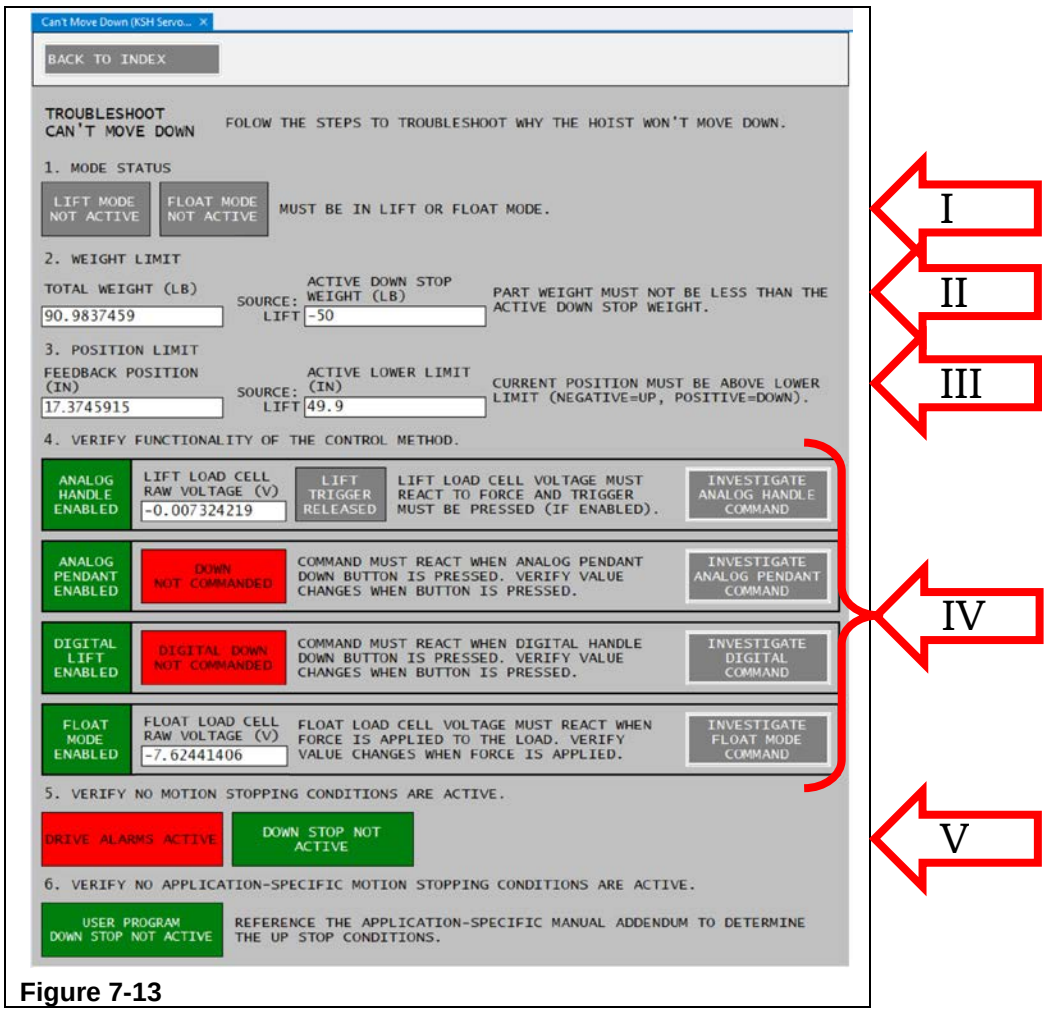


Figure 7-13

7o) Unexpected Motion screen

This screen lists the steps to diagnose any unexpected motion that occurs on the hoist.
(Refer to Figure 7-14)

In section (I), if this banner is green, there is not a command being issued from the analog handle.
If it is red, press the “INVESTIGATE ANALOG HANDLE COMMAND” button to examine the signal.
In section (II), if this banner is green, the analog pendant is enabled.
If it is red, press the “INVESTIGATE ANALOG PENDANT COMMAND” button to examine the signal.
In section (III), if this banner is green, there is a digital command active, either up or down.
If it is red, press the “INVESTIGATE DIGITAL COMMAND” button to examine the signal.
In section (IV), if this banner is green, the float mode is active.
If it is red, press the “INVESTIGATE FLOAT MODE COMMAND” button to examine float mode.

KSS Workspace tree location: Knight WO# \ Troubleshooting \ Unexpected Motion

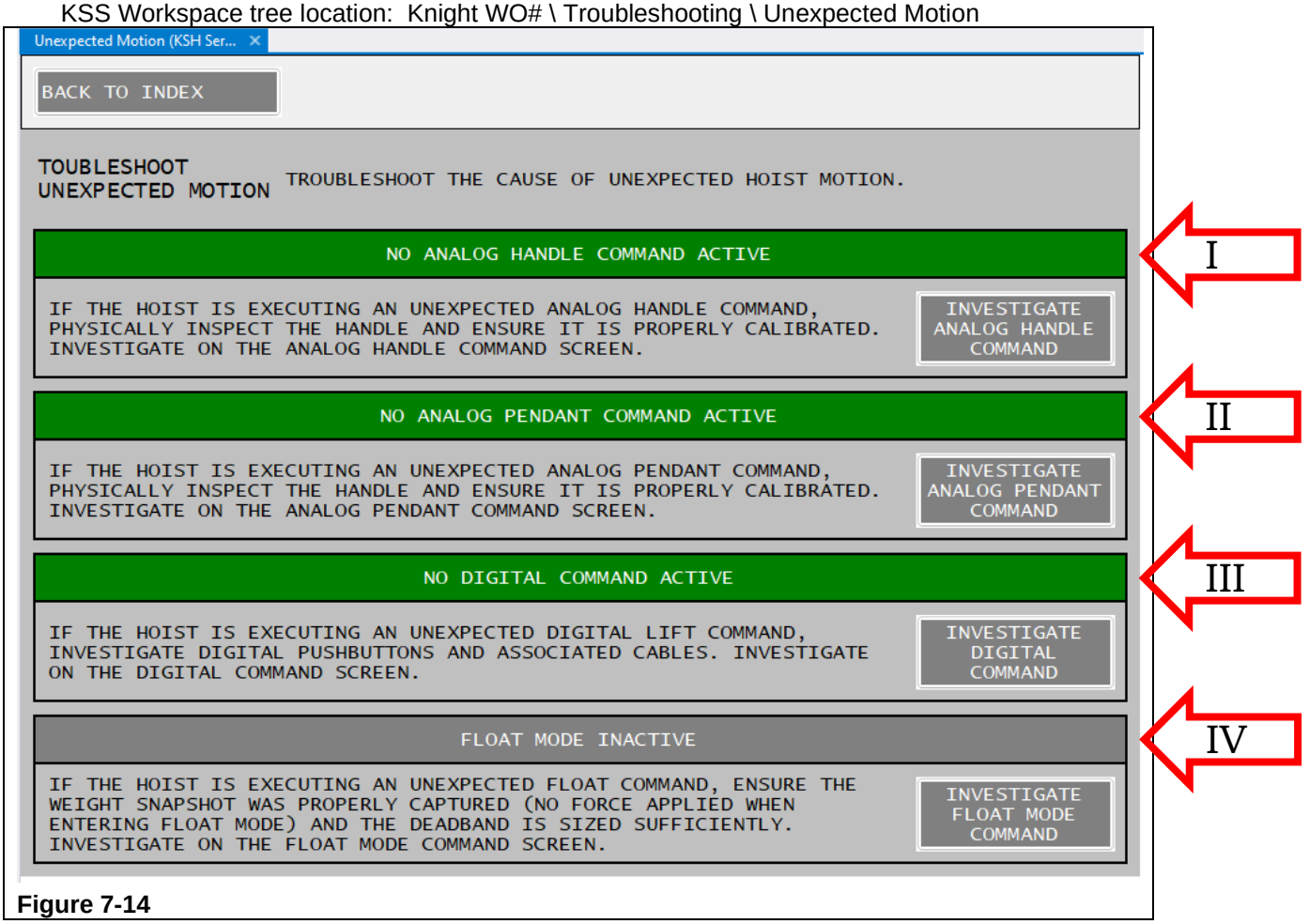


Figure 7-14

7p) Safety Relay screen

This screen lists the steps to diagnose any unexpected motion that occurs on the hoist.
(Refer to Figure 7-15)

In section (I), view the hoist's deceleration time and the last safety relay delay here.
In section (II), if this banner is green, the safe torque off (STO) alarm is not active.
In section (III), if this banner is green, then the Run-Stop button is released.
In section (IV), if this banner is green, the safe torque off (STO) circuit is closed or operational.

KSS Workspace tree location: Knight WO# \ Troubleshooting \ Safety Relay

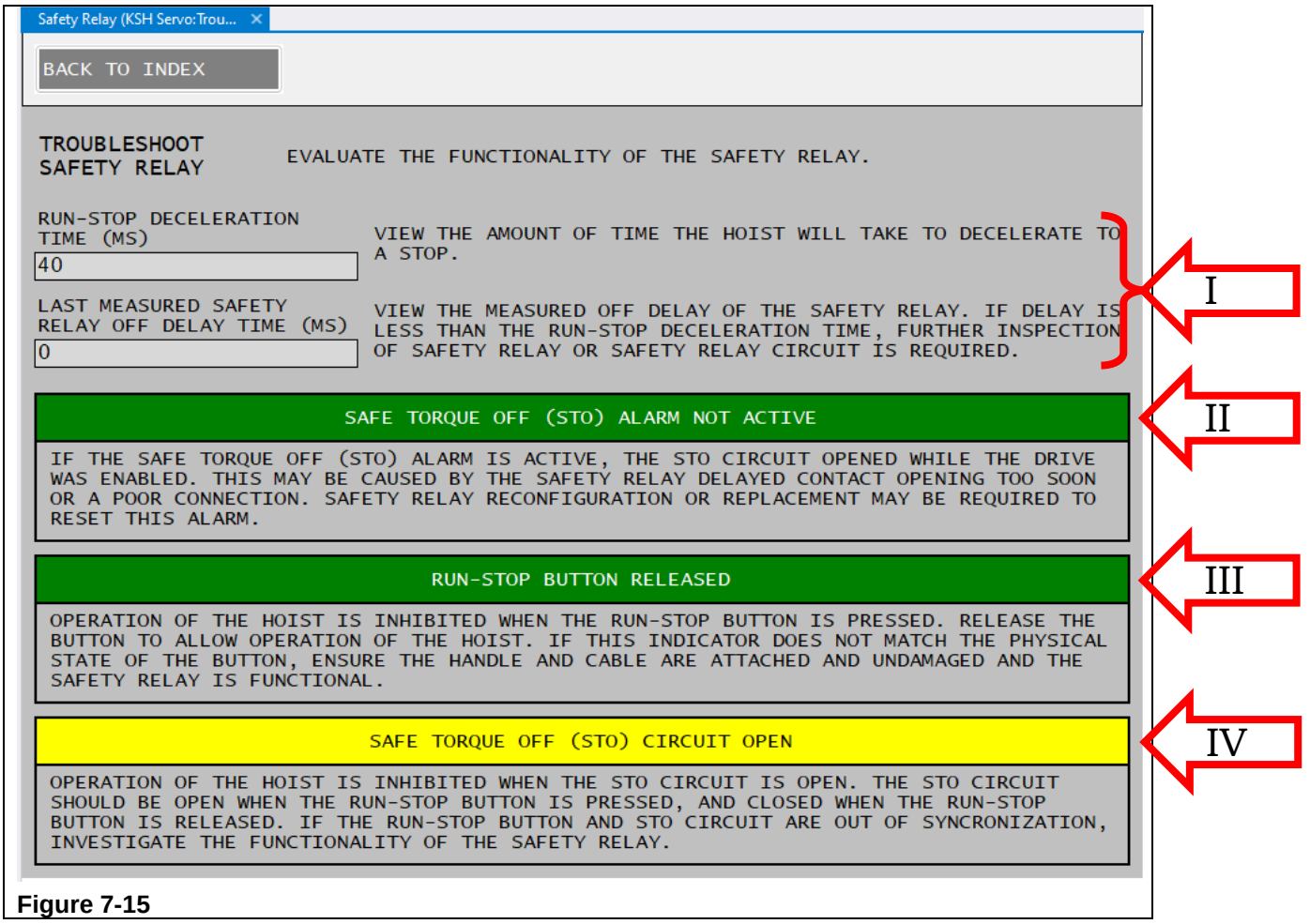


Figure 7-15

B. System Activity screens including Faults, Warnings and Error Codes

There are several System Activity screens covered in this section. Each of these screens is listed below and can be accessed inside the Knight Servo Studio (KSS) software from:
KSS Workspace tree location: Knight Work Order # \ Status \

7q) System Status screen
7r) Drive Alarms/Warnings screen
7s) Program Alarms screen
7t) Program Warnings screen
7u) Heartbeat Status screen
7v) User Program Status screen
7w) Ratchet Brake Alarms screen
7x) Knight Error Codes - These error codes are displayed in the Knight Servo Studio.
7y) Sieb & Meyer Error Codes - These codes are flashed on the servo's 7-segment display.

7q) System Status screen

This screen shows many aspects of the hoist's systems in real time.

In section (I), if the indicator box is green then that the hoist's function is on,
if the indicator box is grey then that the hoist's function does is off or is not included with this hoist, and
if the indicator box is red then function is in a fault or warning state.

This screen gives an overview of the hoist's readiness. (Refer to Figure 7-16)
KSS Workspace tree location: Knight WO# \ Status \ System Status

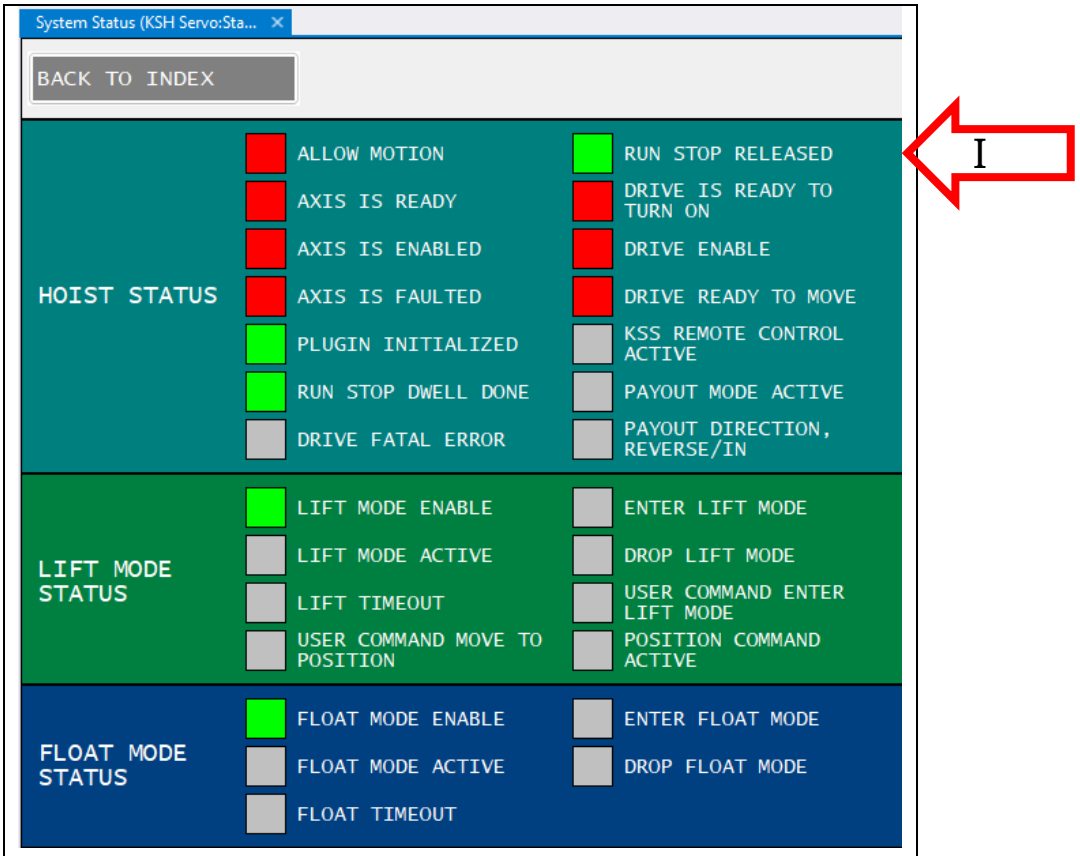


Figure 7-16

7r) Drive Alarms/Warnings screen

This screen shows all drive alarms and warnings that may be active on the hoist. (Refer to Figure 7-17)

In section (I), if the indicator box is red then that fault is active, but if the indicator box is grey then that fault is off or is not valid for the hoist.

This screen graphically shows if a fault is active. If a fault is active it will correspond to a particular fault code. This fault code can be easily viewed at:

KSS Home screen location: Quick View panel \ Row 1 (Lower right-hand portion of the screen).
KSS Workspace tree location: Knight WO# \ Status \ Drive Alarms/Warnings

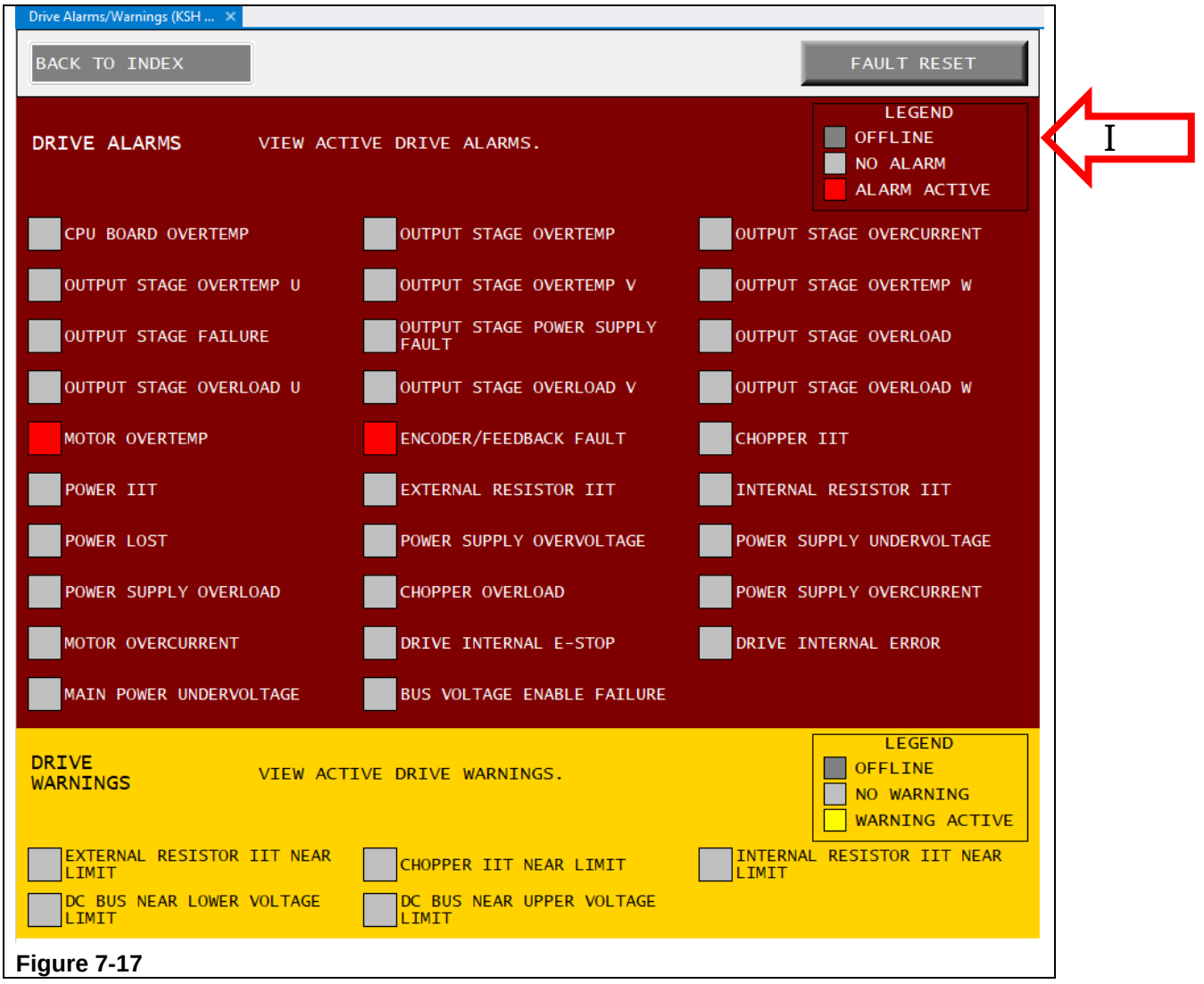


Figure 7-17

7s) Program Alarms screen

This screen shows all program alarms that may be active on the hoist. (Refer to Figure 7-18)

Under section (I), all program alarms are listed. If any indicators are RED, that fault is active.
Any available buttons for a fault will take you to a relevant page for further troubleshooting or information.

This screen graphically shows if a fault is active. If a fault is active it will correspond to a particular fault code.
This fault code can be easily viewed at:

KSS Home screen location: Quick View panel \ Row 1 (Lower right-hand portion of the screen).
KSS Workspace tree location: Knight WO# \ Status \ Program Alarms

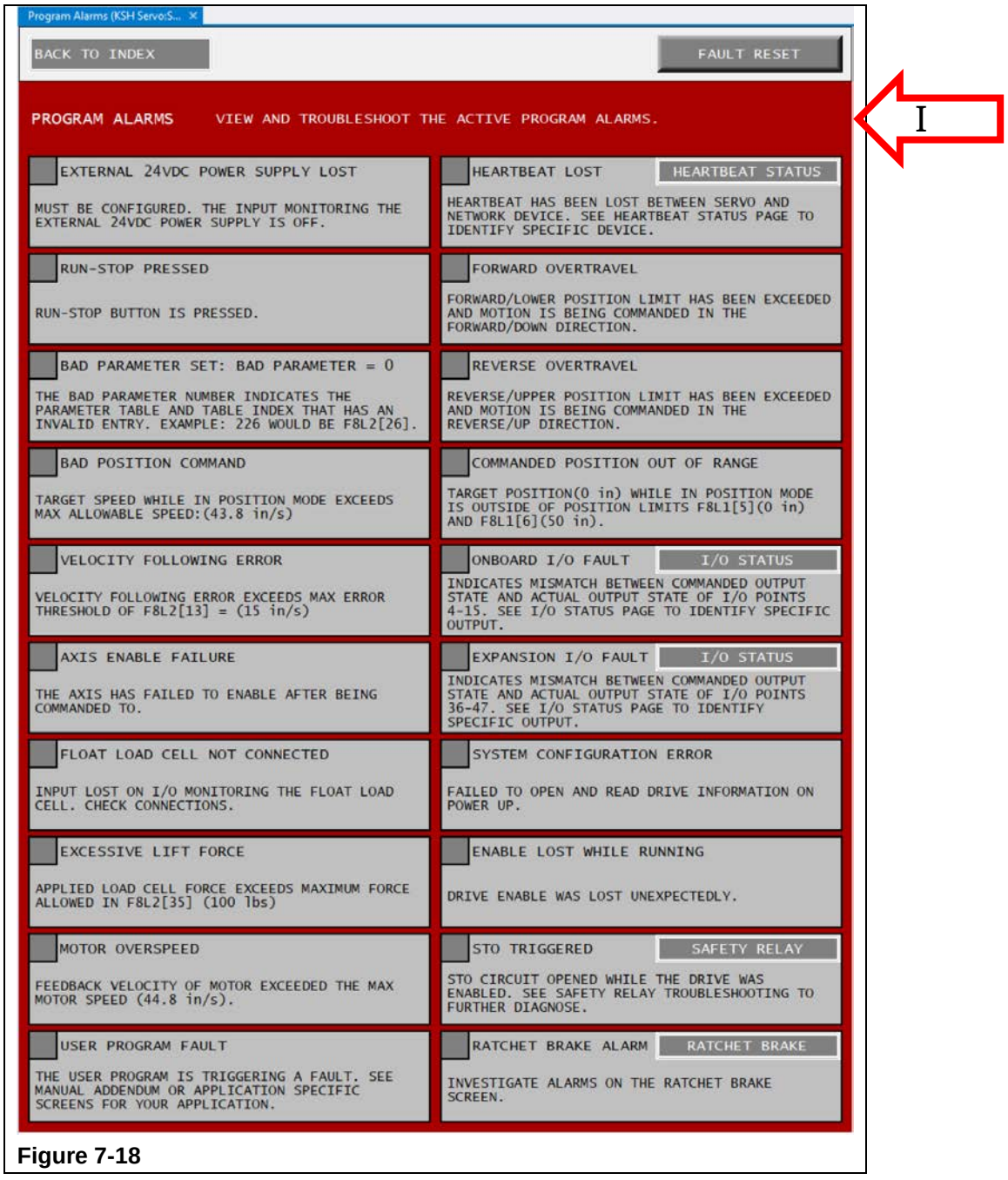


Figure 7-18

7t) Program Warnings screen

This screen shows all program Warnings that may be active on the hoist. (Refer to Figure 7-19)

Under section (I), all program warnings are listed. If any indicators are YELLOW, that warning is active. Any available buttons for a warning will take you to a relevant page for further troubleshooting or information.

KSS Workspace tree location: Knight WO# \ Status \ Program Warnings

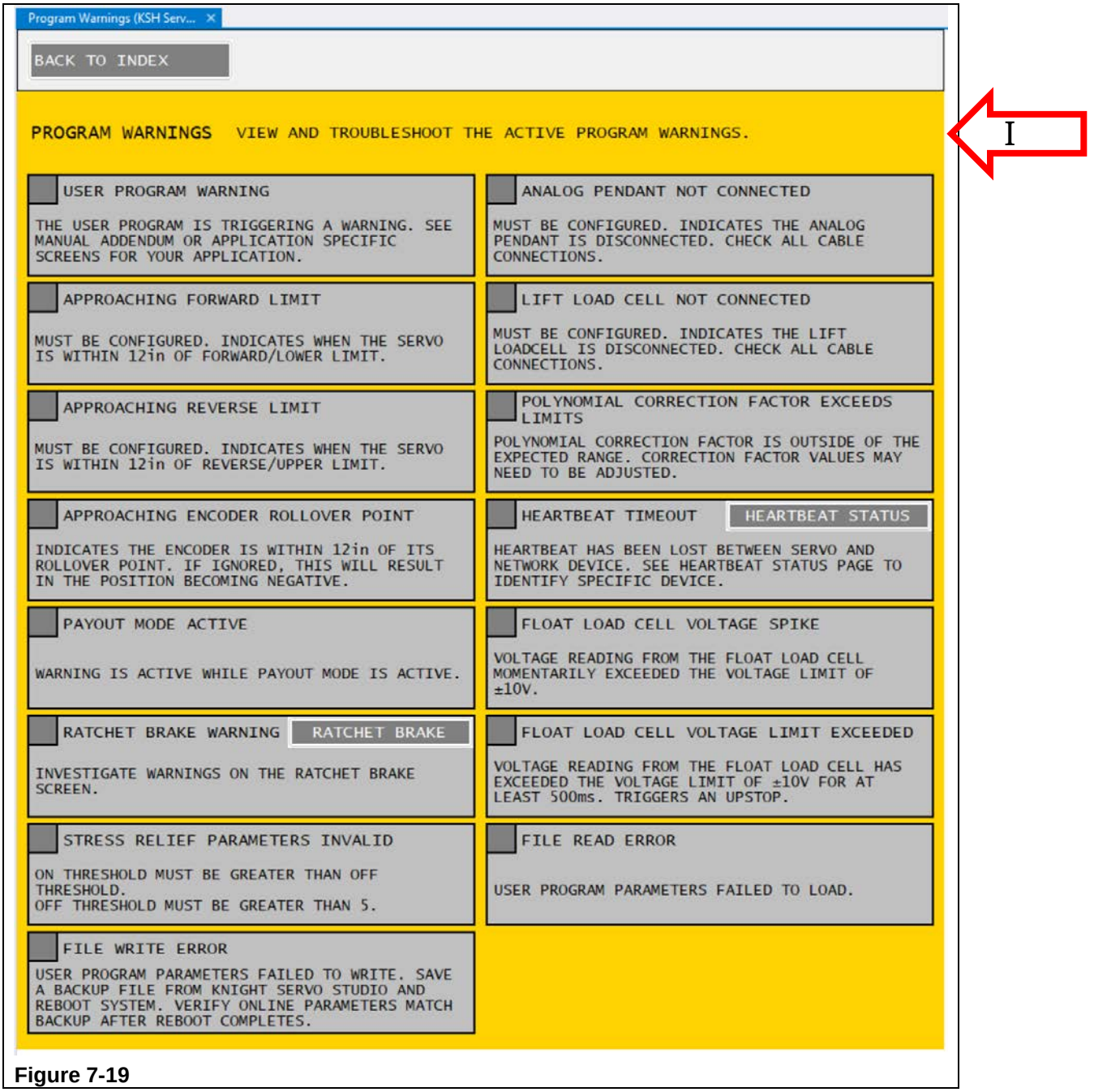


Figure 7-19

7u) Heartbeat Status screen

This screen shows the Heartbeat Status of any connected network devices that may be active on the hoist. (Refer to Figure 7-20)

Under section (I), all Heartbeat faults are listed. This screen shows the Heartbeat Status of any connected network devices.

See the Legend located on the screen for the LED colors which indicate the status of the hardware connected to the servo by a Network connection.

KSS Workspace tree location: Knight WO# \ Status \ Heartbeat Status

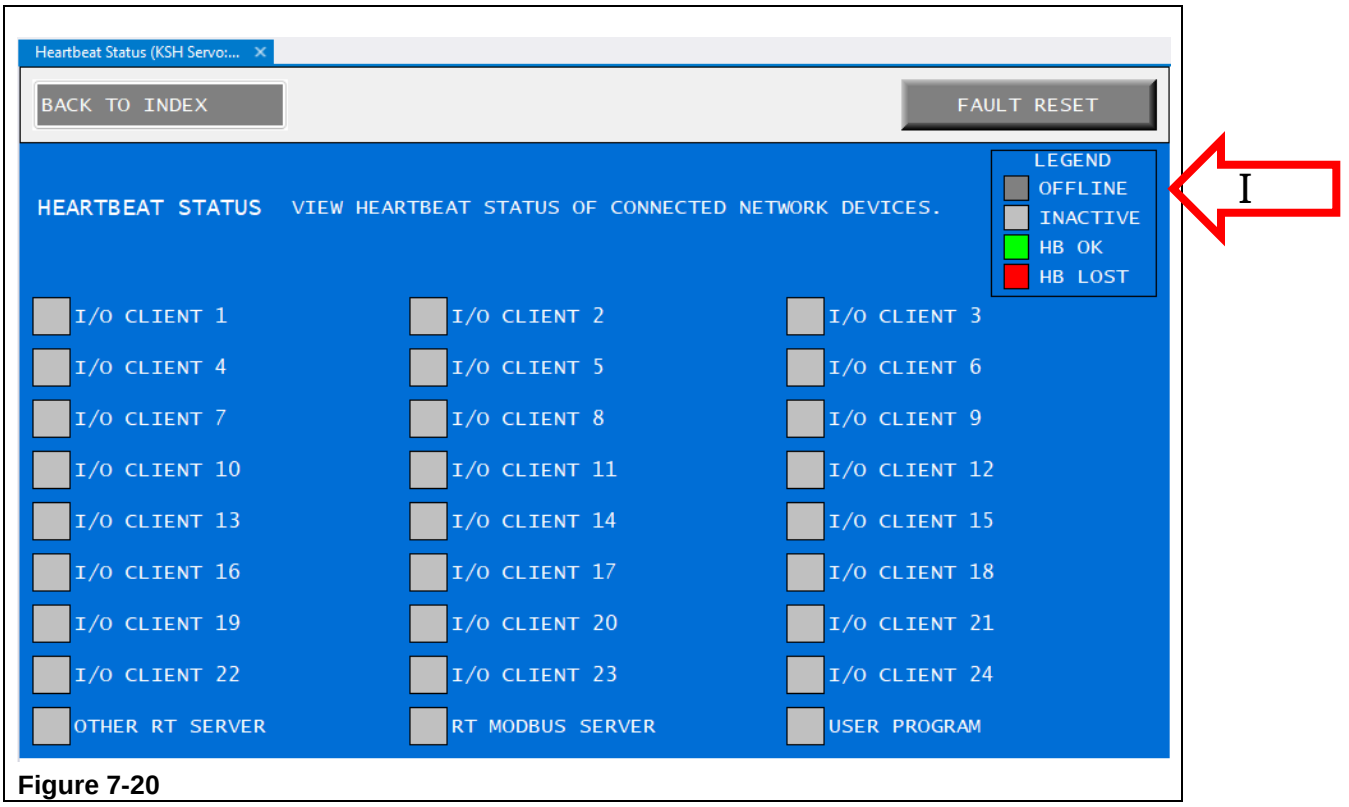


Figure 7-20

7v) User Program Status screen

This screen shows all of the User Program Status variables that may be active on the hoist. (Refer to Figure 7-21). Please note that if any of these values are active, the corresponding F8Lx values will be overridden.

Under section (I), all Program Status variables are listed. If a LED is Green, that user variable is currently active. If it is active, the current value will be displayed.

KSS Workspace tree location: Knight WO# \ Status \ User Program Status

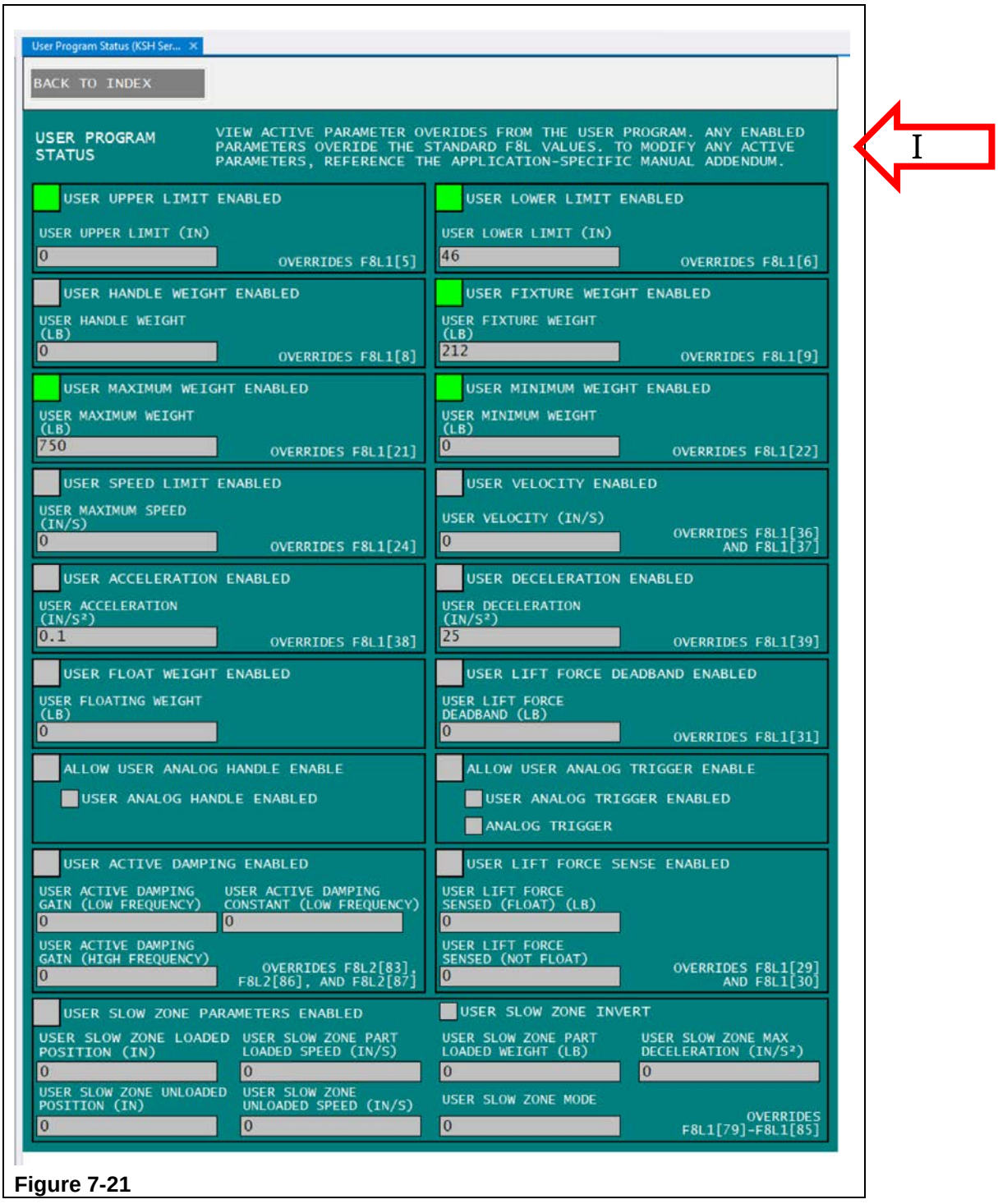


Figure 7-21

7w) Ratchet Brake Alarms screen

This screen shows all of the Ratchet Brake Alarms that may be active on the hoist.
(Refer to Figure 7-22)

In section (I), if the indicator box is red then that fault is active, but if the indicator box is grey then that fault is off or is not valid for the hoist.

This screen graphically shows if a ratchet brake fault is active. If a fault is active it will correspond to a particular fault code. This fault code can be easily viewed at:
KSS Home screen location: Quick View panel \ Row 1 (Lower right-hand portion of the screen).

This screen is only relevant for systems with a Ratchet Brake.

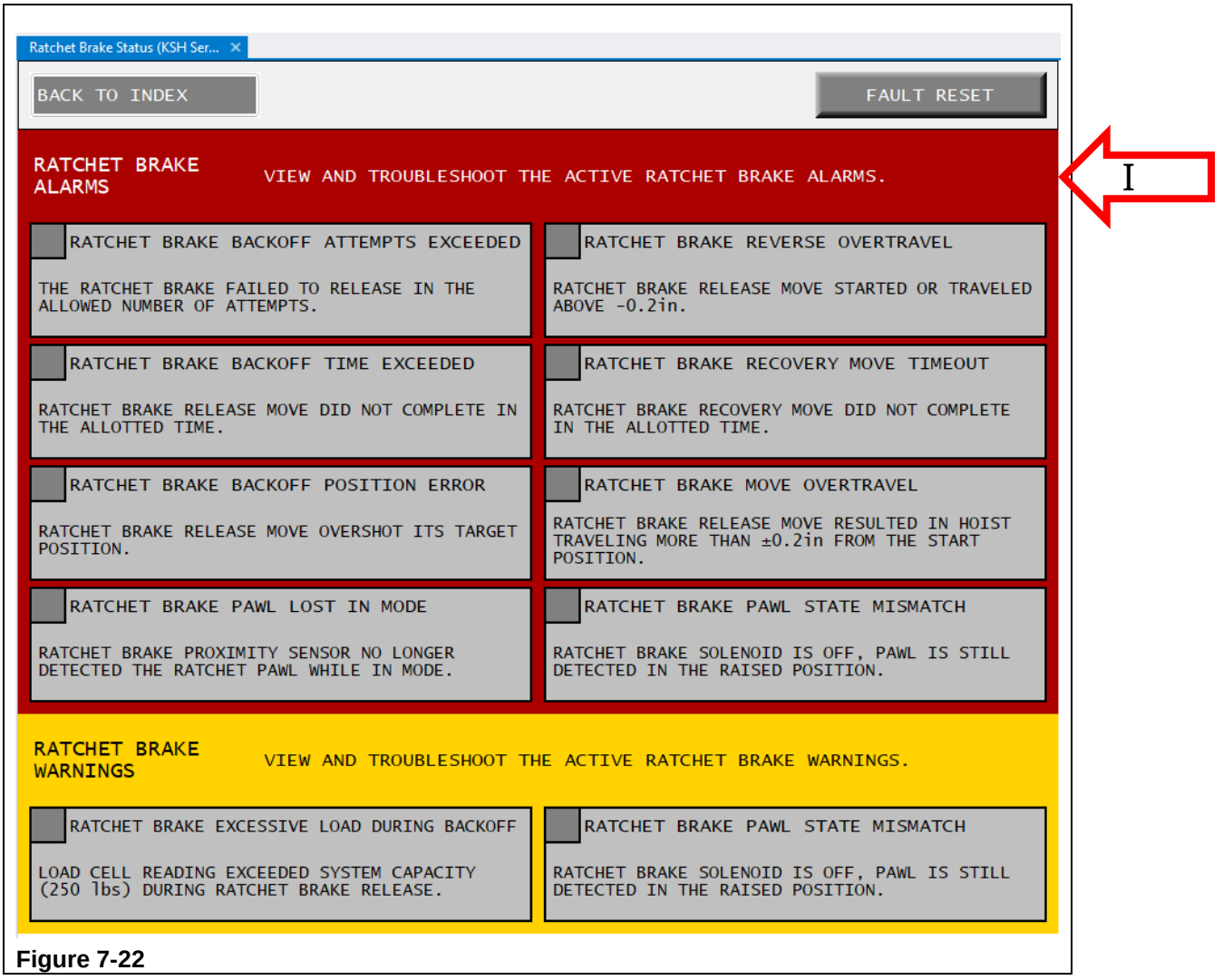


Figure 7-22

7x) Knight Error Codes

These are the error codes that can be generated by the Knight firmware and are displayed within the Knight Servo Studio program located here:

KSS Workspace tree location: Knight Work Order # \ Status \ Active Faults

Error Code	Description
100	External 24VDC Supply Lost
101	Run-Stop button pressed
102	Bad Parameters Set
103	Bad Position Command
104	Velocity Following Error
105	
106	Axis Enable Failure
107	Float Load Cell Not Connected
109	Excessive Lift Force Fault
111	Overspeed Fault
140	User Program Fault
150	Heartbeat Lost Fault
152	Illegal Encoder State
153	Forward Overtravel
154	Reverse Overtravel
250	Commanded Position Out of Range
252	Onboard I/O Fault
253	Expansion I/O Fault
254	Payout Mode Active
255	Fatal Error
256	Output Stage Overcurrent Fault
257	Motor Overcurrent Fault
258	Output Stage Overtemp
259	CPU Board Overtemp
260	Output Overtemperature U Fault
261	Output Overtemperature V Fault
262	Output Overtemperature W Fault
263	Output Stage Failure Fault
264	Output Stage Power Supply Fault
265	Output Stage Overload Fault
266	Output Stage Overload U Fault
267	Output Stage Overload V Fault
268	Output Stage Overload W Fault
269	Motor Overtemp

Error Code	Description
270	Encoder/Feedback Fault
271	Chopper IIT
272	Power IIT
273	Power Lost
274	Internal Resistor IIT
275	External Resistor IIT
276	Power Supply Overload
277	Power Supply Undervoltage
278	Power Supply Overvoltage
279	Chopper Overload
280	Power Supply Overcurrent
281	Enable Lost While Running
282	SM Internal E-Stop
283	SM Internal Error
284	Onboard I/O #4 Fault
285	Onboard I/O #5 Fault
286	Onboard I/O #6 Fault
287	Onboard I/O #7 Fault
288	Onboard I/O #8 Fault
289	Onboard I/O #9 Fault
290	Onboard I/O #10 Fault
291	Onboard I/O #11 Fault
292	Onboard I/O #12 Fault
293	Onboard I/O #13 Fault
294	Onboard I/O #14 Fault
295	Onboard I/O #15 Fault
296	Expansion I/O #36 Fault
297	Expansion I/O #37 Fault
298	Expansion I/O #38 Fault
299	Expansion I/O #39 Fault
300	Expansion I/O #40 Fault
301	Expansion I/O #41 Fault
302	Expansion I/O #42 Fault
303	Expansion I/O #43 Fault
304	Expansion I/O #44 Fault
305	Expansion I/O #45 Fault
306	Expansion I/O #46 Fault
307	Expansion I/O #47 Fault
310	STO Triggered

7y) Sieb & Meyer Error Codes

The 7-segment display located on the front of the Sieb & Meyer SD3 servo drive displays internal error codes programmed by the manufacturer. These error codes are flashed on the display one digit at a time and are preceded by an “E”. For instance, the error “Supply Voltage Too Low” equates to Error Code 0132. The 7-segment display would flash an “E”, then a “0”, then a “1”, then a “3”, then a “2.”. This code will repeat until the error is remedied.

The Knight fault codes displayed in Knight Servo Studio are the primary troubleshooting resource, but the Sieb & Meyer error codes are provided here for reference.

Error Code	Description
0002	Log File
0003	File Not Found
0004	Create XML File
0005	Real Time FIFO
0006	Install ISR
0007	Task Let
0008	ISR Install
0009	Shared Memory Not Found
0010	Undefined State
0011	Wrong Parameter Value
0012	Object Not Found
0013	Wrong Object Size
0014	Parameter File Not Found
0015	Type Plate File Not Found
0016	EEPROM Time Out
0017	EEPROM Check Sum
0018	No Valid Interrupt ID
0019	No Valid Serial Number
0020	Wrong Hardware ID Code
0021	Task Create
0022	Wrong Command
0023	Compensation File Not Found
0024	Command Canceled
0025	Machine Stop
0026	No PCIe Device
0027	FPGA Done Time Out
0028	FPGA Initialization Time Out
0029	Wrong File Format
0030	Mapping
0031	No Shared Memory Block
0032	No Plugin Found
0033	Shared Memory Block Not Found
0034	Shared Memory Block Size
0035	No Response
0036	Buffer Full
0037	Wrong Curve Count
0038	FPGA Wrong Version
0039	Wrong Product Name
0040	Wrong Product ID
0041	Wrong Product Version
0042	Wrong Product ID In Parameter File
0043	Create Object Dictionary File
0044	Create Device Configuration File
0045	Create Parameter Files

Error Code	Description
0046	Hardware File
0047	System Clock Not Set
0048	Motor Type
0049	Motor Control Mode
0073	Quit Reboot
0074	Quit Create Object Dictionary
0075	Quit Create Default Parameter
0076	Quit Program
0077	Quit Restart
0078	Quit IP
0079	Parameter Not Found
0080	Script Execution Fault
0081	Hardware Not Available
0082	FPGA Package File Not Found
0083	Slave Not Found
0112	IIT Power
0113	IIT Chopper Resistor
0114	Input Lost
0115	Undervoltage
0116	Overvoltage
0117	Chopper Overload
0118	DC-DC Converter Fault
0119	DC-DC Overload
0120	PFC Fault
0121	Preload Time
0122	Power Overload
0123	Preload
0124	Power Off
0125	DCO Voltage
0126	DC1 Voltage
0127	DC2 Voltage
0128	Safety Relay NOT Connected
0129	Chopper Resistor Too Low
0130	Chopper Power Too High
0131	Chopper Resistor Power Too High
0132	Supply Voltage Too Low
0133	Chopper Voltage Too Low
0134	Unknown Supply Type
0135	Supply Voltage Too High
0136	IIT Chopper Resistor 80
0137	Restart Application
0138	Incompatible FPGA File

Error Code	Description
0139	FPGA File Does Not Exist
0140	Power User Fault
0141	Power Busy
0142	IIT Chopper Resistor Internal
0143	IIT Chopper Resistor External
0144	IIT Chopper
0145	Chopper Voltage Level
0146	Power Ok
0147	Module Chopper Temperature
0148	Module Rectifier Temperature
0149	IDC Overload
0150	IIT DC Current
0160	Not Calibrated
0161	Profile
0162	Actual Position Not Destination Position
0163	SG Command Busy
0164	Not Operation Enabled
0165	Illegal Cal Method
0166	Illegal Drive Number
0167	Wrong Drive Type
0168	Not Ready To Switch On
0169	Wrong Start Condition
0170	Drive Parameter Fault
0171	Velocity Out Of Limits
0172	Simulated Error
0173	Change On The Fly
0174	Not ln Gantry Mode
0175	Wrong Master
0176	Emergency Stop
0177	Limit Switch P
0178	Limit Switch N
0179	Position Out Of Limits
0180	Parameter Out Of Limits
0181	Motor Temperature
0182	Heat Sink Temperature
0183	Drive Overload
0184	Drive Overvoltage
0185	Drive Undervoltage
0186	Power Stage Off
0187	Gantry Positions Not Equal
0188	Not ln Hold Mode
0189	Power Stage On
0190	Acceleration Out Of Limits
0191	Jerk Out Of Limits
0192	Bad Switching
0193	Overload U
0194	Overload V
0195	Overload W
0196	Overload
0197	No Valid Parameter
0198	Output Stage Off

Error Code	Description
0199	IIT Motor
0200	IIT Output Stage
0201	Module U Temperature
0202	Module V Temperature
0203	Module W Temperature
0204	Water Temperature
0205	Ambient Temperature
0206	Feedback
0207	Over Speed
0208	Output Stage Enabled
0209	Limit Switch Input Not Enabled
0210	Brake Output Not Enabled
0211	Function Disabled
0212	Index Pulse Not Found
0256	NR No Tool
0257	NR Time Out
0258	NR Angle Too Low
0259	NR Angle Too High
0260	NR Torque Out Of Range
0261	NR Friction Torque Too Low
0262	NR Friction Torque Too High
0263	NR Angle Max
0264	NR Current Too Low
0265	NR Current Too High
0266	NR Time Max
0267	NR Illegal Variant
0268	NR Illegal Section
0269	NR Unknown Tool
0270	NR No Transducer
0271	NR No Scanner
0272	NR Start Lost
0273	NR No Valid Section Type
0274	NR Offset Out Of Range
307	Manual Stop
310	STO Triggered
0320	Network Invalid Telegram ID
0321	Network Zero Data
0322	Network CRC
0323	Network Synchronization
0324	Network Configuration
0325	Network NMT
0326	Network Addressing
0327	Network Node Guarding
0328	Network EEPROM
0329	Network Heartbeat
0330	Net Checksumm
0331	Net No Data
0332	Net Wrong Data Count

Error Code	Description
0333	Net Telegram Id
0334	Net Telegram Length
0335	Net No Response
0337	Network Invalid AL Control
0338	Network Unknown AL Control
0339	Network Boot Not Supported
0340	Network No Valid Firmware
0342	Network Invalid Mbx Configuration
0345	Net No Valid Outputs
0346	Net Sync Error
0347	Net SM Watchdog
0349	Net Invalid Sm Out Cfg
0351	Network Invalid SM In Configuration
0361	Network Free Run Needs 3 Buffer Mode
0365	Network Fatal Sync Error
0368	Network Invalid Sync Configuration
0374	Network Sync Zero Cycle Time
0377	Network EE Error
0394	Unknown Command
0395	Access Not Allowed In Actual State
0396	No Access To External Controller
0397	Unknown Preselect
0398	Invalid Interface Id
0496	OEM
0559	OEM End
0640	TI Base
0641	TI Wrong State
0642	TI Command Not Supported
0643	TI Break Command
0644	TI Wrong Address
0645	TI Config Com Port
0646	TI Device Not Supported
0647	TI No Connection
0650	TI UART Config COM Port
0651	TI UART RX Buffer 0 Overflow
0652	TI UART RX Buffer 1 Overflow
0653	TI UART TX Buffer 0 Overflow
0654	TI UART TX Buffer 1 Overflow
0655	TI UART CRC Error

Error Code	Description
0656	TI UART Telegram Counter
0661	TI IIC Wrong Mode
0662	TI IIC Write Data
0663	TI IIC ACK
0664	TI IIC NACK
0665	TI IIC STOP
0666	TI IIC PSR
0667	TI IIC Device
0668	TI IIC res28
0669	TI IIC res29
0670	Tl ZMDI IIC
0671	TI ZMDI Measurement
0672	TI ZMDI CRC Error
0673	TI ZMDI Command Not Supported
0674	TI Semaphore
0688	Short Circuit Earth Leakage
0689	Earth Leakage
0690	Earth Leakage L1
0691	Earth Leakage L2
0692	Earth Leakage L3
0693	Short Circuit
0694	Short Circuit L1
0695	Short Circuit L2
0696	Short Circuit L3
0697	Internal Current 1
0698	Interna Current 2
0699	Over Current Ramp Fct
0700	Over Current Sequence
0701	Continues Over Current Internal
0702	Continues Over Current Internal 1
0703	Continues Over Current Internal 2
0704	Short Circuit Earth Leakage Internal
0705	Earth Leakage Internal
0706	Short Circuit Internal
0707	Continues Over Current
0708	Continues Over Current 1
0709	Continues Over Current 2
0710	Short Circuit Earth Leakage Motor
0711	Earth Leakage Motor
0712	Earth Leakage U
0713	Earth Leakage V
0714	Earth Leakage W
0715	Short Circuit Motor
0716	Short Circuit Motor U
0717	Short Circuit Motor V
0718	Short Circuit Motor W
0719	Load Level IIt
0720	Load Level IIt Warning
0721	Mains Over Voltage

Error Code	Description
0722	Mains Over Voltage L1
0723	Mains Over Voltage L2
0724	Mains Over Voltage L3
0725	Mains Under Voltage
0726	Mains Under Voltage L1
0727	Mains Under Voltage L2
0728	Mains Under Voltage L3
0729	Phase Failure
0730	Phase Failure L1
0731	Phase Failure L2
0732	Phase Failure L3
0733	Phase Sequence
0734	Mains Frequency
0735	Mains Frequency Too Great
0736	Mains Frequency Too Small
0737	DC Link Over Voltage
0738	DC Link Over Voltage 1
0739	DC Link Over Voltage 2
0740	DC Link Under Voltage
0741	DC Link Under Voltage 1
0742	DC Link Under Voltage 2
0743	Load Error
0744	Output Over Voltage
0745	Output Over Voltage U
0746	Output Over Voltage V
0747	Output Over Voltage W
0748	Armature Circuit
0749	Armature Circuit Interrupted
0750	Field Circuit
0751	Field Circuit Interrupted
0752	Excess Ambient Temperature
0753	Too Low Ambient Temperature
0754	Supply Air Temperature
0755	Supply Air Outlet Temperature
0756	Excess Device Temperature
0757	Too Low Device Temperature
0758	Temperature Drive
0759	Excess Temperature Drive
0760	Too Low Temperature Drive
0761	Temperature Supply
0762	Excess Temperature Supply
0763	Too Low Temperature Supply
0764	Supply
0765	Supply Low Voltage
0766	Supply Voltage U1
0767	Supply Voltage U2
0768	Supply Voltage U3
0769	Supply Voltage U4
0770	Supply Voltage U5
0771	Supply Voltage U6
0772	Supply Voltage U7

Error Code	Description
0773	Supply Voltage U8
0774	SupplyVoltage_U9
0775	Supply Intermediate Circuit
0776	Control
0777	Measurement Circuit
0778	Computing Circuit
0779	Operating Unit
0780	Power Section
0781	Output Stage
0782	Chopper
0783	Input Stage
0784	Contacts
0785	Contact 1
0786	Contact 2
0787	Contact 3
0788	Contact 4
0789	Contact 5
0790	Fuses
0791	S1
0792	S2
0793	S3
0794	S4
0795	S5
0796	S6
0797	S7
0798	S8
0799	S9
0800	Hardware Memory
0801	Ram
0802	Rom E Prom
0803	EEProm
0804	Software Reset
0805	Data Record 01
0806	Data Record 02
0807	Data Record 03
0808	Data Record 04
0809	Data Record 05
0810	Data Record 06
0811	Data Record 07
0812	Data Record 08
0813	Data Record 09
0814	Data Record 10
0815	Data Record 11
0816	Data Record 12
0817	Data Record 13
0818	Data Record 14
0819	Data Record 15
0820	Loss Of Parameters
0821	Parameter Error
0822	Power
0823	Brake Chopper

Error Code	Description
0824	Failure Brake Chopper
0825	Over Current Brake Chopper
0826	Protective Circuit Brake Chopper
0827	Motor
0828	Motor Blocked
0829	Motor Error Or Commutation Fault
0830	Motor Tilled
0831	Measurement Circuit1
0832	Sensor
0833	Tacho Fault
0834	Tacho Wrong Polarity
0835	Resolver 1 Fault
0836	Resolver 2 Fault
0837	Incremental Sensor 1 Fault
0838	Incremental Sensor 2 Fault
0839	Incremental Sensor 3 Fault
0840	Speed
0841	Position
0842	Computation Circuit
0843	Communication
0844	Serial Interface 1
0845	Serial Interface 2
0846	Data Storage
0847	Torque Control 1
0848	Excess Torque
0849	Difficult Start Up
0850	Stand Still Torque
0851	Insufficient Torque
0852	Torque Fault
0853	Velocity Speed Controller
0854	Position Controller
0855	Positioning Controller
0856	Following Error
0857	Reference Limit
0858	Sync Controller
0859	Winding Controller
0860	Process Data Monitoring
0861	Control 2
0862	Deceleration
0863	Sub Synchronous Run
0864	Stroke Operation
0865	Control 3
0866	Watchdog
0867	Main Voltage NOK
0868	Main Voltage Lost
0869	Charging Voltage Source
0870	No Option Module
0871	No Device Driver
0872	No Master Device
0873	No Slave Device
0874	No Configuration File

Error Code	Description
0875	Register Domain
0876	Register Syns
0877	Register Slave
0878	Activate Master
0879	Scan Bus Failed
0880	Create Domain
0881	Domain Data Pointer
0882	Pdo Config
0883	Slave Config
0884	PlugIn Not Available
0885	Sdo Fault
0886	Option Not Enabled
0887	Object Access
0888	Motor Phase Lost
0889	Net Work State
0890	Object Not Found
0891	Config File Not Found
0892	Class Exists
0893	Instance Exists
0894	Attribute Exists
0895	Class Does Not Exist
0896	Instance Does Not Exist
0897	Attribute Does Not Exist
0898	Network Not Found
0899	Communication Error
0900	Option Not Available
0901	Option Not Available
0902	Option Not Available
0903	Already Configured
0904	Not Configured
0905	Socket Fault
0906	Option Not Available
0907	EEProm Write Error
0908	

C: Troubleshooting Inputs and Outputs

This screen can be used to inspect the hoist's Inputs and Outputs. This screen can be accessed inside the Knight Servo Studio (KSS) software from:
KSS Workspace tree location: Knight Work Order # \ Status

7z) I/O Status screen

7z) I/O Status screen
This screen shows each of the onboard inputs and outputs.

In section (I), see the legend for the indicator colors.

This screen graphically shows if an Input or Output is On or Off.

(Refer to Figure 7-23)

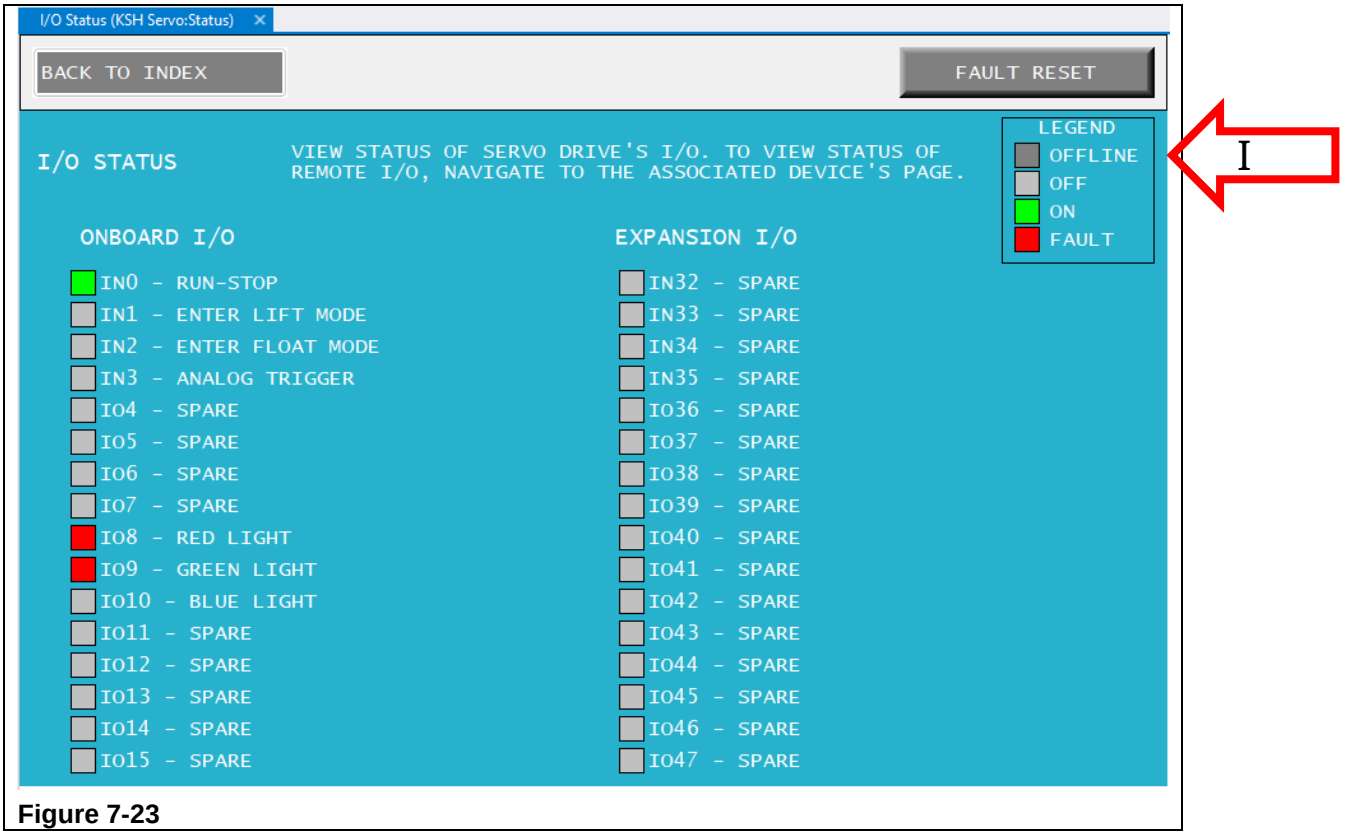


Figure 7-23

D: Troubleshooting Chart

The Servo Hoist operation may be affected by various factors. If your hoist is not performing as well as expected, follow the table below to diagnose the problem. If unable to resolve the issue, contact the Knight Service Department at (248) 377-4950 x162 or via e-mail at service@knightglobal.com.

Problem	Cause	Solution
Hoist does not lift or lower	Power loss	Check circuit breaker, fuses, switches, and connections of all power lines. Check Run-Stop button, reset if necessary.
	Incorrect voltage	Check supply voltage and frequency of power supply to ensure it is correct for the Servo Hoist.
	Electrical fault	Secure power to the hoist; check all wiring and connections on the Servo Hoist.
	Program Fault	Connect to Knight Servo Studio and ensure there are no program faults
Servo Hoist lifts but does not lower	"Lower Travel Limit" set incorrectly	Check parameter F8L1:06 “Forward / Lower Limit (in)”.
	Damaged pendant cord	Check each conductor in the pendant cable for continuity. Replace damaged cable as required.
Servo Hoist lowers but will not lift	"Upper Travel Limit" set incorrectly	Check parameter F8L1:05 “Reverse / Upper Limit (in)”.
	Damaged pendant cord	Check each conductor in the pendant cable for continuity. Replace damaged cable as required.
	Hoist capacity exceeded	Reduce the weight of the load to within the rated or programmed capacity of the Servo Hoist.
	Low voltage in power supply	Determine the cause of low voltage and restore voltage back to within +/-10% of required voltage supply.
Servo Hoist does not lift at proper speed	Hoist capacity exceeded	Reduce the weight of the load to within the rated or programmed capacity of the Servo Hoist.
	Low voltage in power supply	Determine the cause of low voltage and restore voltage back to within +/-10% of required voltage supply.
Servo Hoist operates intermittently	Open / Short circuit	Check circuit for loose connections or broken conductors. Repair or replace as necessary.
	Damaged pendant cord	Check each conductor in the pendant cable for continuity. Replace damaged cable as required.
	Damaged handle	Check each conductor in the pendant cable for continuity. Check connections and replace if necessary. Replace damaged conductors as required.
Continuously flashing Green light using an Up/Down Pendant	Damaged pendant cord or switch	Check each conductor in the pendant cable for continuity. Check switch for correct functionality. Replace damaged part as required.

8. SPARE PARTS LIST

Because Knight is continuously improving and updating its products, all product drawings and spare parts lists for this Servo Hoist are provided as supporting documentation accompanying this manual and delivered with the system.

9. DECOMMISSIONING OF A SERVO HOIST

Knight Servo Hoists contain various materials which, at the end of the service life, must be disposed of or recycled (where appropriate), in accordance with statutory regulations.

Decommissioning:

	**WARNING**
	Knight Servo Hoists must be decommissioned by qualified personnel.

- Ensure there is not a load on the hoist.
- Remove power from hoist.
- Remove hoist from rail or support structure.
- If desired, Knight Global will properly dispose of the hoist.
  Contact a Knight Global representative to obtain a Return Material Authorization form.

10. KNIGHT'S PERFORMANCE WARRANTY

Knight warrants that its products and parts shall meet all applicable specifications, performance requirements, and be free from defects in material and workmanship for one year, (Servo Systems for (2) two years, Pneumatic Lift Tables for (5) five years), from the date of invoice, unless otherwise noted.

Knight warrants the Servo Hoist, Arms, and Tractors to be free from defects in material or workmanship for a period of two years or 6000 hours use from the date of shipment.

On design and build jobs, the customer is the owner of the equipment once they authorize shipment. The purchased equipment cannot be returned for reimbursement or credit.

Exclusions

This warranty shall not cover the failure or defective operation caused by inadequate training provided by customer regarding the operation and/ or maintenance of the tool, misuse, negligence, misadjustment, or any alteration not approved by Knight Global. Knight's obligation is limited to the replacement or repair of Knight's products at a location designated by Knight Global. Buyer is responsible for all associated internal removal and reinstallation costs as well as freight charges to and from Knight Global. Knight's maximum liability shall not in any case exceed the contract price for the products claimed to be defective.

Any field modification made to Knight Products or Systems without the written authorization by Knight Global shall void Knight's warranty obligation.

Any purchased components not manufactured by Knight Global and their specific individual warranties are not covered. Paint defects, scratches and marring from shipping are also excluded on all Knight Global products and products not manufactured by Knight Global.

Knight Distributors/ Agents are not authorized to circumvent or change any of these terms and/ or conditions of this warranty unless prior approval is received in writing by Knight Global Management. Verbal statements made by Knight Distributors/ Agents do not constitute warranties.

Disclaimer

OTHER THAN AS SET FORTH HEREIN, NO OTHER EXPRESSED WARRANTIES, AND NO IMPLIED WARRANTIES, ORAL AND WRITTEN, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE BY KNIGHT GLOBAL WITH RESPECT TO ITS PRODUCTS AND ALL SUCH WARRANTIES ARE HEREBY SPECIFICALLY DISCLAIMED.

KNIGHT GLOBAL SHALL NOT BE LIABLE UNDER ANY CIRCUMSTANCES FOR ANY INCIDENTAL, SPECIAL AND/OR CONSEQUENTIAL DAMAGES WHATSOEVER, WHETHER OR NOT FORESEEABLE, INCLUDING BUT NOT LIMITED TO DAMAGES FOR LOST PROFITS AND ALL SUCH INCIDENTAL, SPECIAL AND/OR CONSEQUENTIAL DAMAGES ARE HEREBY ALSO SPECIFICALLY DISCLAIMED. KNIGHT GLOBAL WILL NOT BE LIABLE FOR ANY LOSS, INJURY OR DAMAGE TO PERSONS OR PROPERTY, NOR FOR DAMAGES OF ANY KIND RESULTING FROM FAILURE OR DEFECTIVE OPERATION OF ANY MATERIALS OR EQUIPMENT FURNISHED HEREUNDER.

11. APPENDIX A: USB LOCATION IN SERVO HOIST MANUAL

Location of Electronic Knight Servo Hoist Technical Manual and Documentation

Knight has migrated to a complete set of controls documentation in electronic format that is located on a USB drive, in an effort to reduce waste of natural resources.
A USB drive is created for each Knight Servo System order and is placed in the inside of the front cover of the Knight Servo Technical Manual binder which ships with each job.
Please refer to Figure 1 and Figure 2 below.

Knight Servo System Technical Manual and USB Drive

Figure 1

Figure 2

The typical folder layout structure of the Knight Servo System information on the USB drive is shown in Figure 3.

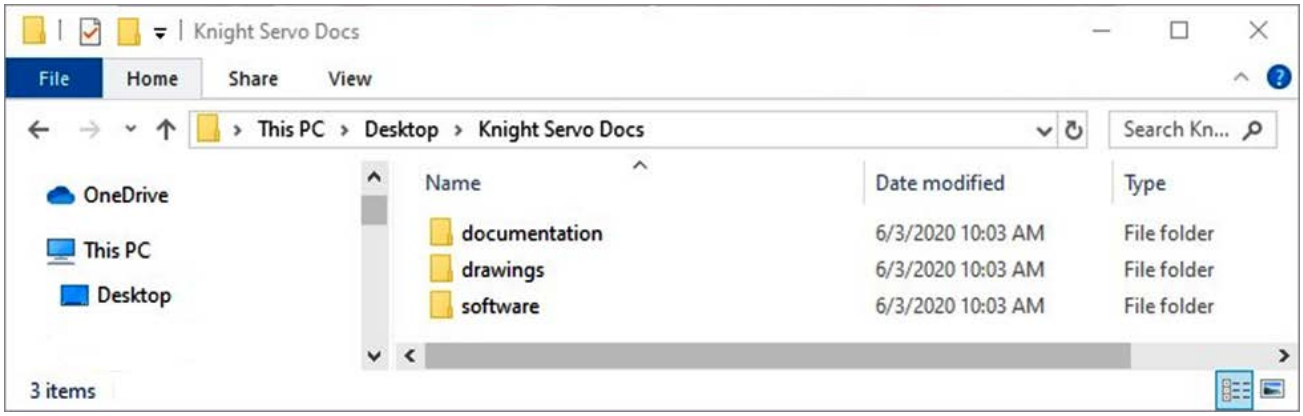


Figure 3

12. APPENDIX B: 250lb and 500lb SERVO INFORMATION

Knight includes a Recommended Spare Parts list and a set of electrical drawings with each system. Below is an example of a Recommended Spare Parts list (Figure 1) and standard system layouts (Figures 2 - 5) for a 250lb or a 500lb servo system.

250lb and 500lb STANDARD SERVO
KNIGHT SERVO HOIST
RECOMMENDED SPARE PARTS

PART NUMBER	DESCRIPTION	MANUFACTURER
KCA1040-xx.001	19-PIN COIL CABLE, xxFT	KNIGHT GLOBAL
KCA1057-xx.001	POWER CABLE, 3C, 12AWG, SOOW, xxFT	KNIGHT GLOBAL
KSAA1003.001	CHAIN WEAR GAUGE	KNIGHT GLOBAL
A165ELS24D02	ILLUMINATED PB, RED, MUSHROOM, 24VDC	OMRON
QX5302	ILLUMINATED PB, GREEN, 24VDC	BULGIN
QX5301	ILLUMINATED PB, BLUE, 24VDC	BULGIN
KCA1037.001	SIEB & MEYER 3.8 KVA SERVO DRIVE	KNIGHT GLOBAL
KSHA1005.001	KOLLMORGEN SERVO MOTOR	KNIGHT GLOBAL
KCA1035-1M.001	MOTOR POWER / BRAKE CABLE, M23, 1M	KNIGHT GLOBAL
KCA1036-1M.001	MOTOR ENCODER FEEDBACK CABLE, M23, 1M	KNIGHT GLOBAL
WDR-60-24	POWER SUPPLY, 24VDC, 2.5A	MEAN WELL
2TLA010070R0400	SAFETY RELAY	ABB
2966171	SLICE RELAY, 24VDC, SPDT	PHOENIX
KSHD1017.001	1/2" GRAPHITE PLUG X 3" LG.	KNIGHT GLOBAL
KDSA1010.001	SDS CHAIN REPLACEMENT KIT, 4mm, 18FT	KNIGHT GLOBAL

250lb Servo Reducer Assembly

KDSA1000.004	REDUCER ASSEMBLY, 250 LB, 18' CHAIN	KNIGHT GLOBAL

500lb Servo Reducer Assembly

KDSA1002.001	REDUCER ASSEMBLY, 500 LB, 18' CHAIN	KNIGHT GLOBAL

Figure 1

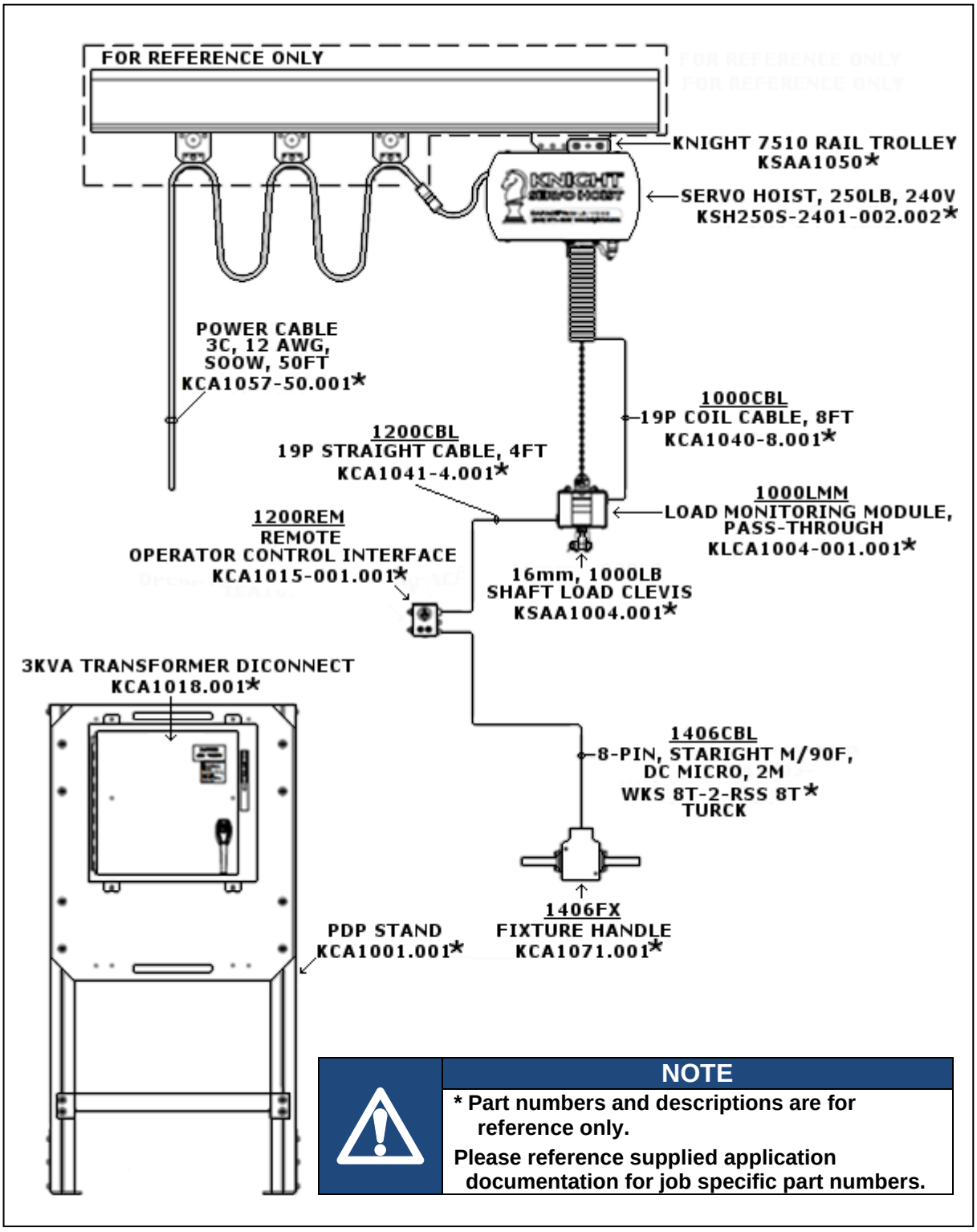
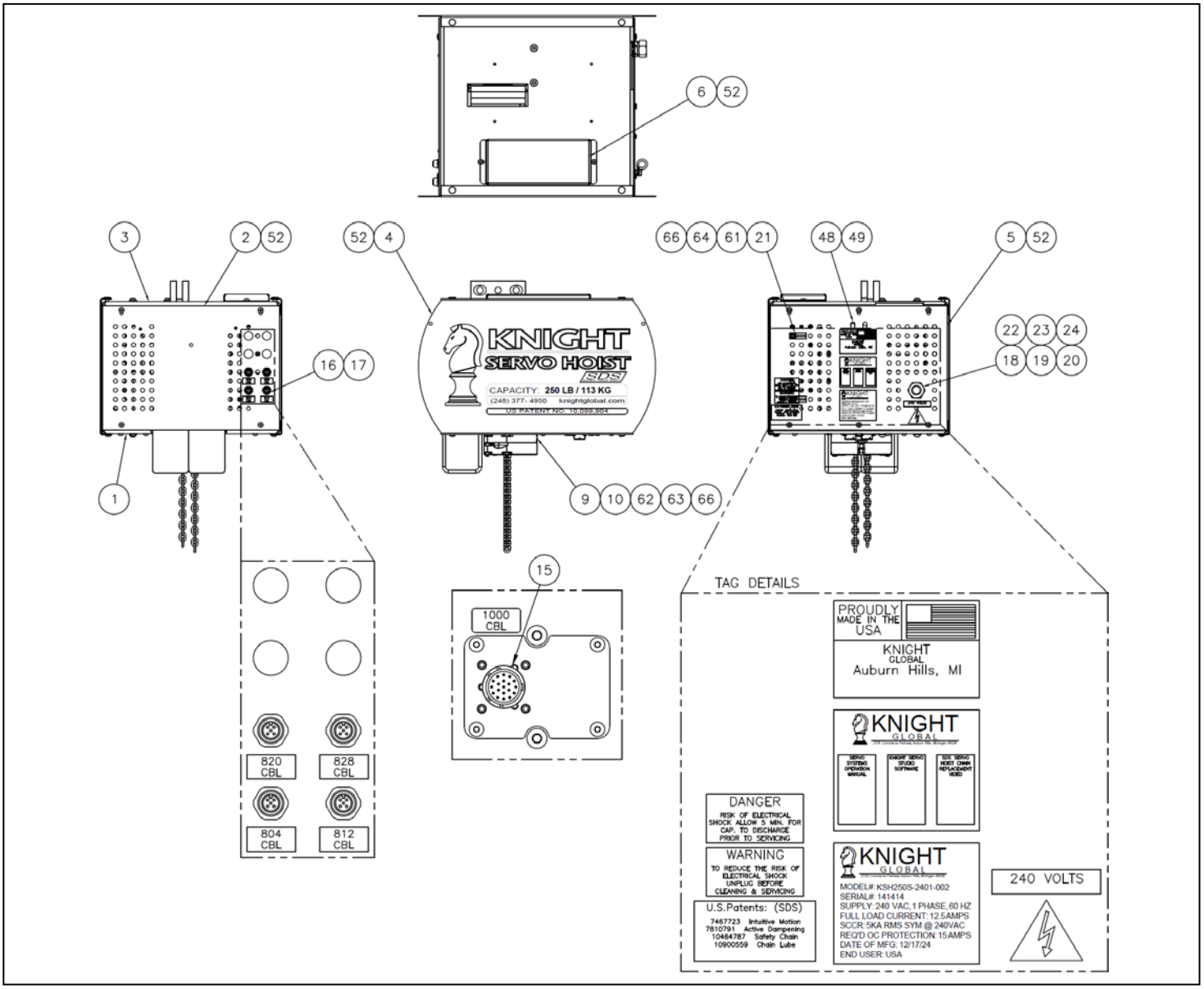

FOR REFERENCE ONLY
KNIGHT 7510 RAIL TROLLEY
KSAA1050*
SERVO HOIST, 250LB, 240V
KSH250S-2401-002.002*
POWER CABLE
3C, 12 AWG,
SOOW, 50FT
KCA1057-50.001*
1000CBL
19P COIL CABLE, 8FT
KCA1040-8.001*
1200CBL
19P STRAIGHT CABLE, 4FT
KCA1041-4.001*
1000LMM
LOAD MONITORING MODULE,
PASS-THROUGH
KLCA1004-001.001*
1200REM
REMOTE
OPERATOR CONTROL INTERFACE
KCA1015-001.001*
16mm, 1000LB
SHAFT LOAD CLEVIS
KSAA1004.001*
3KVA TRANSFORMER DICONNECT
KCA1018.001*
1406CBL
8-PIN, STARIGHT M/90F,
DC MICRO, 2M
WKS 8T-2-RSS 8T*
TURCK
1406FX
FIXTURE HANDLE
KCA1071.001*
PDP STAND
KCA1001.001*
NOTE
* Part numbers and descriptions are for reference only.
Please reference supplied application documentation for job specific part numbers.

Figure 2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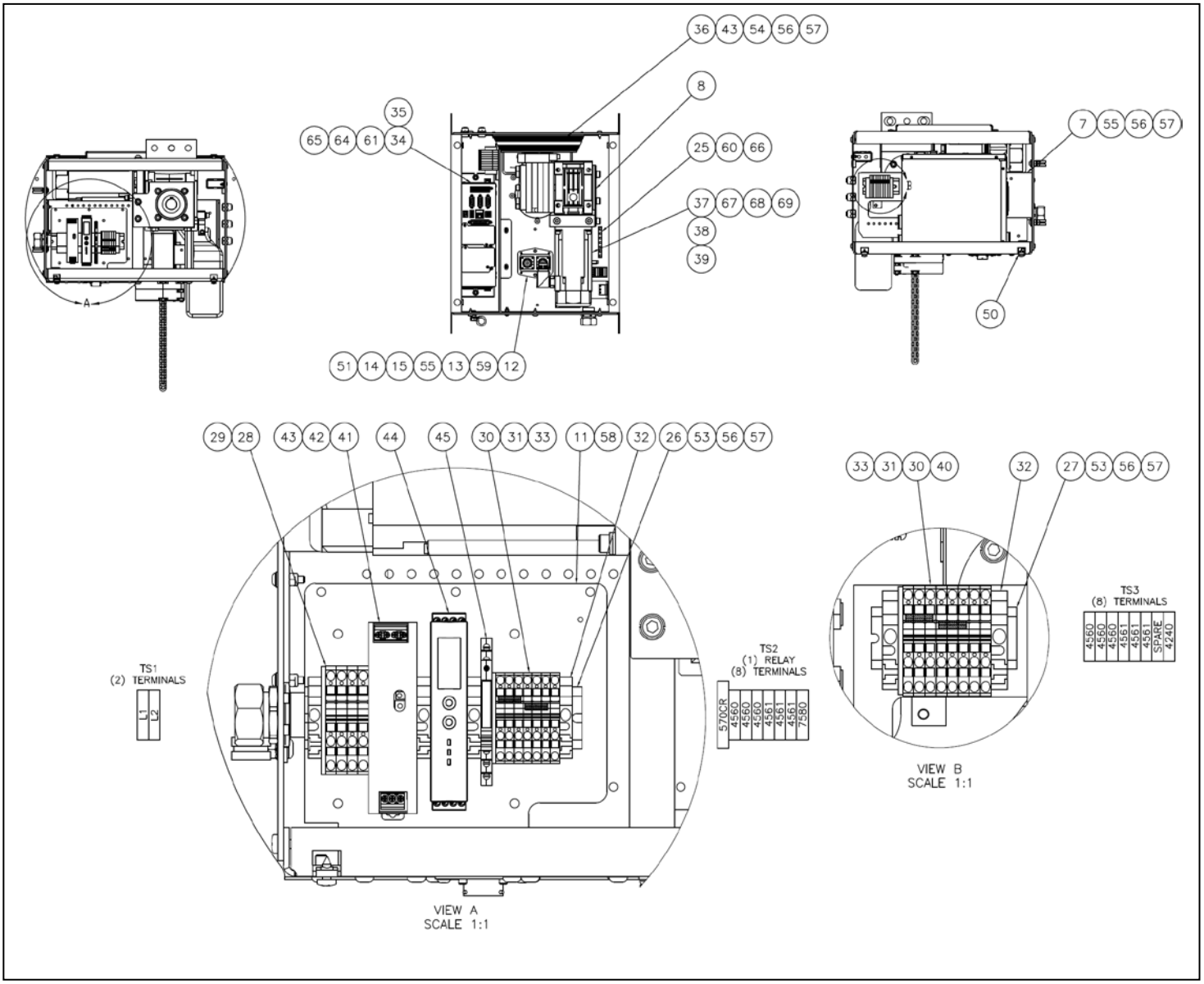
KNIGHT
SERVO HOIST
SDS
CAPACITY: 250 LB / 113 KG
(248) 377- 4950 knightglobal.com
US PATENT NO. 10,669,664
9
10
62
63
66
15
1000
CBL
820
CBL
828
CBL
804
CBL
812
CBL
TAG DETAILS
PROUDLY
MADE IN THE
USA
KNIGHT
GLOBAL
Auburn Hills, MI
KNIGHT
GLOBAL
DANGER
RISK OF ELECTRICAL SHOCK ALLOW 5 MIN. FOR CAP. TO DISCHARGE PRIOR TO SERVICING
WARNING
TO REDUCE THE RISK OF ELECTRICAL SHOCK UNPLUG BEFORE CLEANING & SERVICING
U.S.Patents: (SDS)
7467723 Intuitive Motion
7810791 Active Dampening
10464787 Safety Chain
10900559 Chain Lube
KNIGHT
GLOBAL
MODEL#: KSH250S-2401-002
SERIAL#: 141414
SUPPLY: 240 VAC, 1 PHASE, 60 HZ
FULL LOAD CURRENT: 12.5AMPS
SCCR: 5KA RMS SYM @ 240VAC
REQ'D OC PROTECTION: 15AMPS
DATE OF MFG: 12/17/24
END USER: USA
240 VOLTS

Figure 3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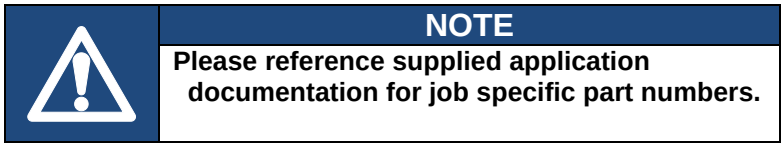
51 14 15 55 13 59 12
7 55 56 57
50
29 28 43 42 41 44 45 30 31 33 11 58 32 26 53 56 57
TS1
(2) TERMINALS
L1
L2
TS2
(1) RELAY
(8) TERMINALS
570CR
4560
4560
4560
4561
4561
4561
7580
VIEW A
SCALE 1:1
33 31 30 40 32 27 53 56 57
TS3
(8) TERMINALS
4560
4560
4560
4561
4561
4561
SPARE
4240
VIEW B
SCALE 1:1

Figure 4

	DET	QTY	PART NUMBER	DESCRIPTION	MANUFACTURER
	69	4	M6	LOCK WASHER	COMMERCIAL
	68	4	M6	WASHER	COMMERCIAL
	67	4	M6 x 30mm LG.	SHCS	COMMERCIAL
	66	18	M6	HEX KEPS NUT	COMMERCIAL
	65	2	M6	NYLOK NUT	COMMERCIAL
	64	4	M6	WASHER	COMMERCIAL
	63	4	M6 x 50mm LG.	BHCS	COMMERCIAL
	62	1	M6 x 25mm LG.	BHCS	COMMERCIAL
	61	4	M6 x 20mm LG.	BHCS	COMMERCIAL
	60	2	M6 x 16mm LG.	BHCS	COMMERCIAL
	59	2	M6 x 14mm LG.	BHCS	COMMERCIAL
	58	3	M6 x 12mm LG.	BHCS	COMMERCIAL
	57	10	M4	NYLOK NUT	COMMERCIAL
	56	8	M4 NOM.	FLAT WASHER	COMMERCIAL
	55	8	M4 x 16mm LG.	BHCS	COMMERCIAL
	54	2	M4 x 12mm LG.	BHCS	COMMERCIAL
	53	4	M4 x 10mm LG.	BHCS	COMMERCIAL
	52	16	#12 x 1/2 LG.	PAN HEAD PHILLIPS	COMMERCIAL
	51	4	#4-40 x 3/8 LG.	SHCS	COMMERCIAL
	50	4	94808A153	CLIP-ON NUT, 10-24	MCMASTER-CARR
	49	2	3960T4	SNAP HOOK	MCMASTER-CARR
	48	1	90312A371	LANYARD, 36"	MCMASTER-CARR
	47				
	46				
★	45	1	2966171	SLICE RELAY, 24VDC	PHOENIX
★	44	1	2TLA010070R0400	SAFETY RELAY	ABB
	43	2	240-2079-ND	FERRITE SLEEVE	STEWARD
	42	1	490-8814-ND	CAPACITOR, 0.1uF	LITTELFUSE
★	41	1	WDR-60-24	POWER SUPPLY, 24VDC, 2.5A	MEAN WELL
	40	1	1.5KE47CA	TVS DIODE, 1.5KW	LITTELFUSE
★	39	1	KCA1036-1M.001	MOTOR ENCODER FEEDBACK CABLE, M23, 1M	KNIGHT GLOBAL
★	38	1	KCA1035-1M.001	MOTOR POWER / BRAKE CABLE, M23, 1M	KNIGHT GLOBAL
★	37	1	KSHA1005.001	KOLLMORGEN SERVO MOTOR	KNIGHT GLOBAL
	36	1	2097-R2	SHUNT RESISTOR	ALLEN BRADLEY
	35	1	KCA1034-141414.001	SWISSBIT 16GB MICRO SD CARD	KNIGHT GLOBAL
★	34	1	KCA1037.001	SIEB & MEYER 3.8 KVA SERVO DRIVE	KNIGHT GLOBAL
	33	4	3030174	JUMPER, 3 POLE	PHOENIX
	32	6	0800886	TERMINAL ANCHOR	PHOENIX
	31	2	3030488	END BARRIER	PHOENIX
	30	15	3209549	TERMINAL	PHOENIX
	29	1	3208977	LARGE END BARRIER	PHOENIX
	28	2	3211771	LARGE TERMINAL	PHOENIX
	27	1	0514500000-3.25	MOUNTING RAIL, DIN	WEIDMULLER
	26	1	0514500000-7.25	MOUNTING RAIL, DIN	WEIDMULLER
	25	1	KDSD1060.001	GROUND BAR ~ ALTER	KNIGHT GLOBAL
	24	1	HBL4579C	RECEPTACLE, 3P, 15A, 250V	HUBBELL
	23	1	HBL4570C	PLUG, 3P, 15A, 250V	HUBBELL
	22	1	221203-6	POWER CABLE, 12/3 OLFLEX TRAY II, BLACK, 6 FT	LAPP
	21	2	SPN-8	CABLE CLAMP, 1/2"	RICHCO
	20	1	BL-75	LOCK NUT, 3/4"	APPLETON
	19	1	STG-75	SEAL RING, 3/4"	APPLETON
	18	1	CG-5075S	CORDGRIP, 3/4"	APPLETON
	17	4	62MP0625	5/8" ID LOCKING RIGID PLASTIC PLUG	MCMASTER-CARR
	16	4	FKFD 4.4-2	4 PIN RECEPTACLE, MICRO	TURCK
	15	1	KCA1016.001	19 PIN WIRE HARNESS	ORRI
	14	1	KDSD1053.001	TAP BACKER PLATE	KNIGHT GLOBAL
	13	1	KDSD1044.001	SINGLE 19 PIN MOUNTING PLATE	KNIGHT GLOBAL
	12	1	KDSD1043.001	RETAINER PLATE	KNIGHT GLOBAL
	11	1	KDSD1010.005	COMPONENT MOUNTING BRACKET	KNIGHT GLOBAL
	10	1	KDSD1046.002	CABLE CLAMP	KNIGHT GLOBAL
	9	1	KDSD1008.002	SAFETY DROP STOP CHAIN GUIDE	KNIGHT GLOBAL
★	8	1	KDSA1000.004	REDUCER ASSEMBLY, 250 LB, 18' CHAIN	KNIGHT GLOBAL
	7	1	KDSD1007.002	INNER SUPPORT PLATE, SMALL HOIST	KNIGHT GLOBAL
	6	1	KDSD1006.001	ACCESS COVER, SMALL HOIST	KNIGHT GLOBAL
	5	1	KDSD1002.003	BACK PLATE, SMALL HOIST	KNIGHT GLOBAL
	4	2	KDSD1003.001	SIDE COVER, SMALL HOIST	KNIGHT GLOBAL
	3	1	KDSD1005.002	TOP COVER, SMALL HOIST	KNIGHT GLOBAL
	2	1	KDSD1000.001	FRONT PLATE, SMALL HOIST	KNIGHT GLOBAL
	1	1	KDSD1004.003	BOTTOM COVER, SMALL HOIST	KNIGHT GLOBAL

★= RECOMMENDED SPARE PART, A = ACCESSORY

Figure 5



13. APPENDIX C: 350lb, 750lb and 1000lb SERVO INFORMATION

Knight includes a Recommended Spare Parts list and a set of electrical drawings with each system. Below is an example of a Recommended Spare Parts list (Figure 1) and standard system layouts (Figures 2 - 5) for a 350lb, 750lb or a 1000lb servo system.

350lb, 750lb and 1000lb STANDARD SERVO
KNIGHT SERVO HOIST
RECOMMENDED SPARE PARTS

PART NUMBER	DESCRIPTION	MANUFACTURER
KCA1040-xx.001	19-PIN COIL CABLE, xxFT	KNIGHT GLOBAL
KCA1057-xx.001	POWER CABLE, 3C, 12AWG, SOOW, xxFT	KNIGHT GLOBAL
KSAA1003.001	CHAIN WEAR GAUGE	KNIGHT GLOBAL
A165ELS24D02	ILLUMINATED PB, RED, MUSHROOM, 24VDC	OMRON
QX5302	ILLUMINATED PB, GREEN, 24VDC	BULGIN
QX5301	ILLUMINATED PB, BLUE, 24VDC	BULGIN
KCA1037.001	SIEB & MEYER 3.8 KVA SERVO DRIVE	KNIGHT GLOBAL
KSHA1006.001	KOLLMORGEN SERVO MOTOR	KNIGHT GLOBAL
KCA1035-1M.001	MOTOR POWER / BRAKE CABLE, M23, 1M	KNIGHT GLOBAL
KCA1036-1M.001	MOTOR ENCODER FEEDBACK CABLE, M23, 1M	KNIGHT GLOBAL
WDR-60-24	POWER SUPPLY, 24VDC, 2.5A	MEAN WELL
2TLA010070R0400	SAFETY RELAY	ABB
2966171	SLICE RELAY, 24VDC, SPDT	PHOENIX
KSHD1017.001	1/2" GRAPHITE PLUG x 3" LG.	KNIGHT GLOBAL
KDSA1011.001	SDS CHAIN REPLACEMENT KIT, 5mm, 12FT	KNIGHT GLOBAL

350lb Servo Reducer Assembly

KDSA1001.001	REDUCER ASSEMBLY, 350 LB, 12' CHAIN	KNIGHT GLOBAL

750lb Servo Reducer Assembly

KDSA1003.001	REDUCER ASSEMBLY, 750 LB, 12' CHAIN	KNIGHT GLOBAL

1000lb Servo Reducer Assembly

KDSA1004.003	REDUCER ASSEMBLY, 1000 LB, 12' CHAIN	KNIGHT GLOBAL

Figure 1

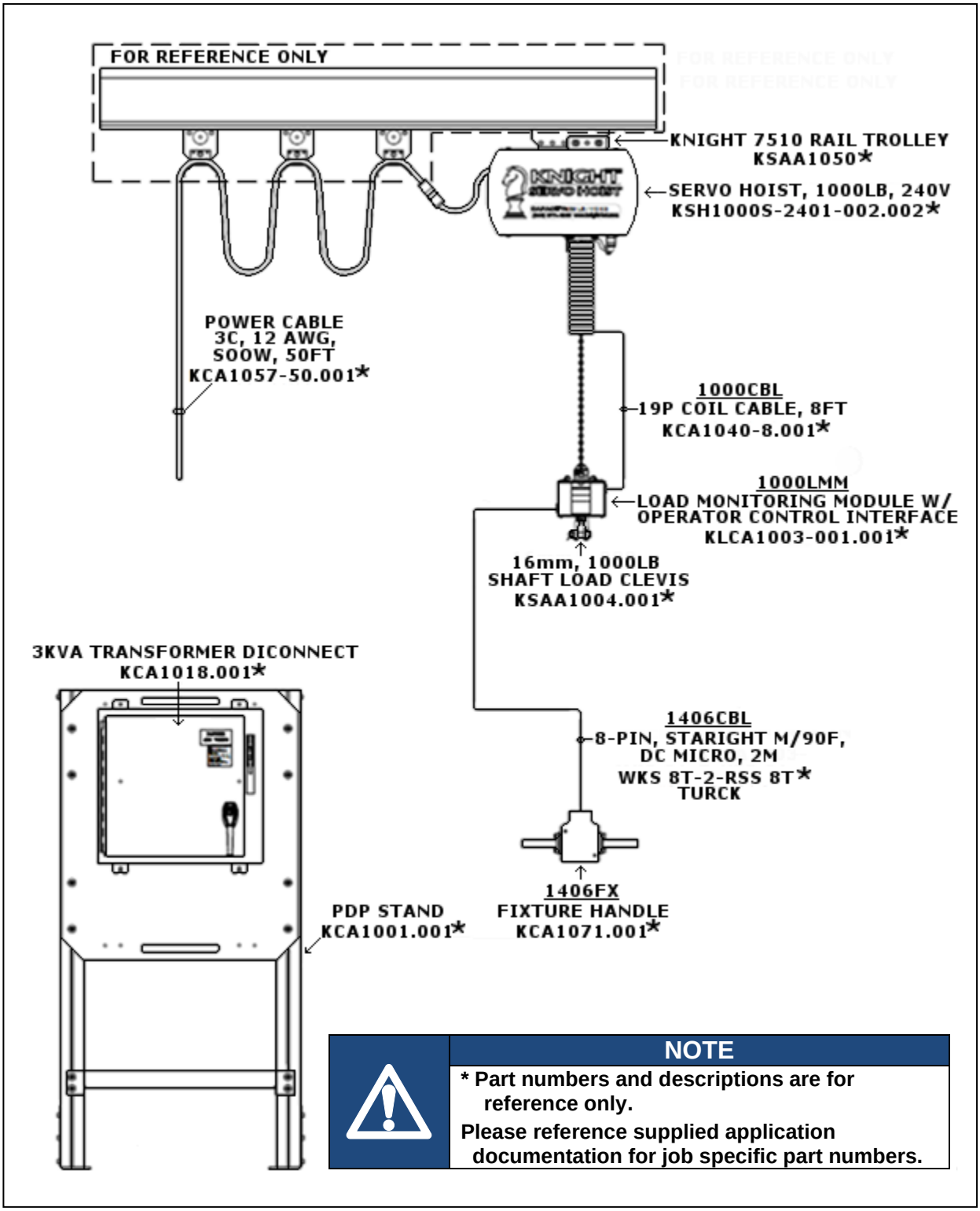
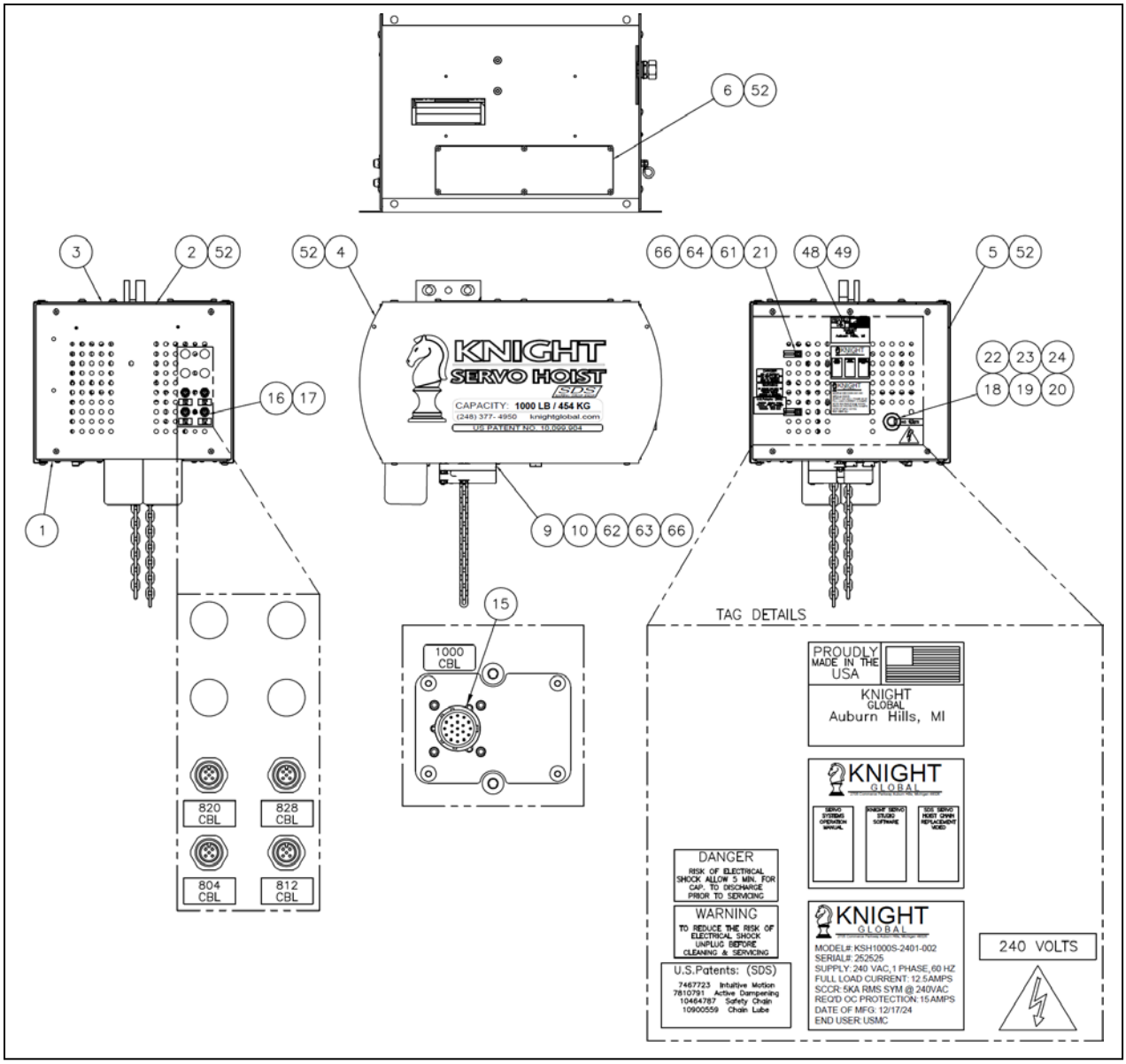

FOR REFERENCE ONLY
KNIGHT 7510 RAIL TROLLEY
KSAA1050*
SERVO HOIST, 1000LB, 240V
KSH1000S-2401-002.002*
POWER CABLE
3C, 12 AWG,
SOOW, 50FT
KCA1057-50.001*
1000CBL
19P COIL CABLE, 8FT
KCA1040-8.001*
1000LMM
LOAD MONITORING MODULE W/
OPERATOR CONTROL INTERFACE
KLCA1003-001.001*
16mm, 1000LB
SHAFT LOAD CLEVIS
KSAA1004.001*
3KVA TRANSFORMER DICONNECT
KCA1018.001*
1406CBL
8-PIN, STARIGHT M/90F,
DC MICRO, 2M
WKS 8T-2-RSS 8T*
TURCK
1406FX
FIXTURE HANDLE
KCA1071.001*
PDP STAND
KCA1001.001*
NOTE
* Part numbers and descriptions are for reference only.
Please reference supplied application documentation for job specific part numbers.

Figure 2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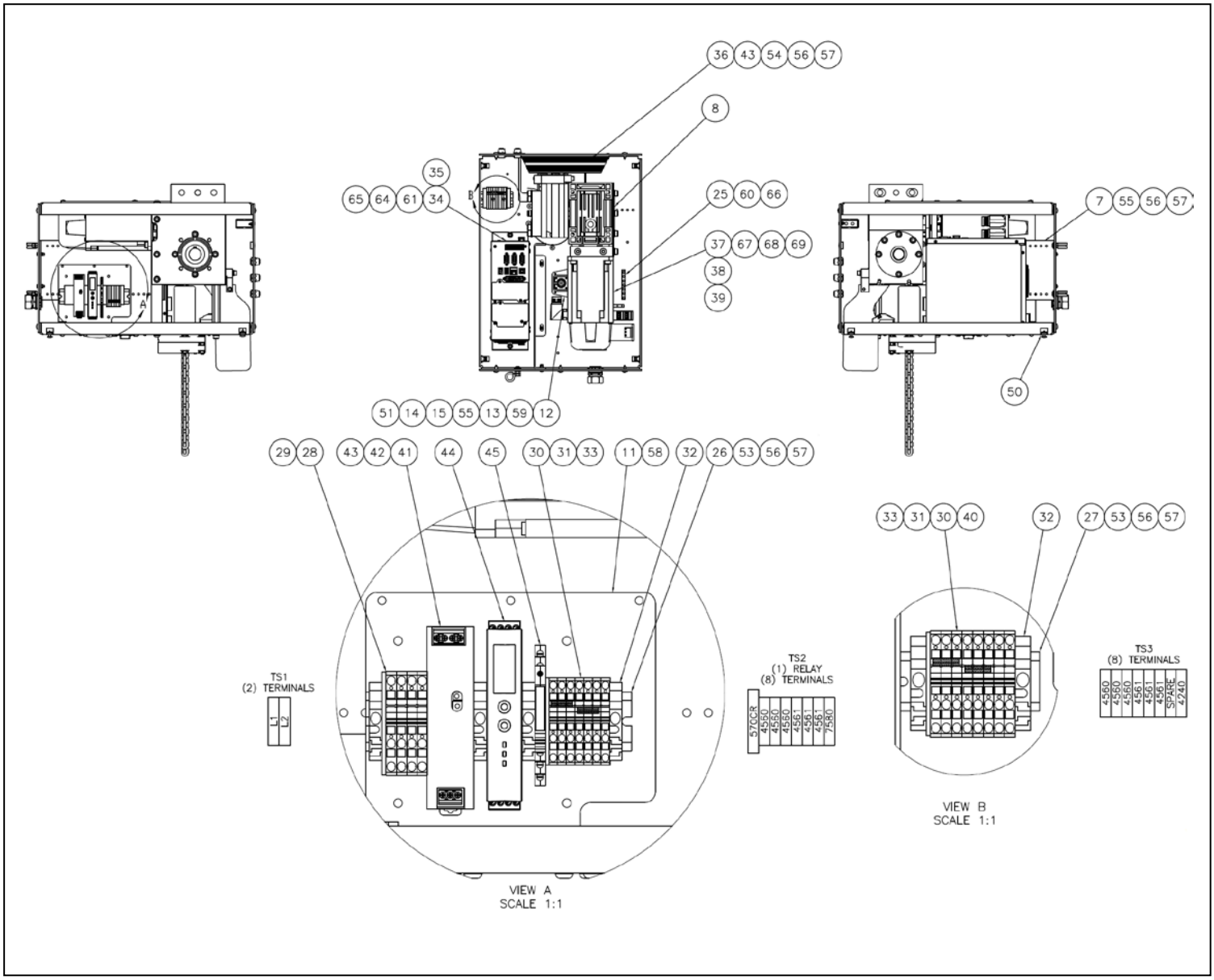
KNIGHT
SERVO HOIST
SDS
CAPACITY: 1000 LB / 454 KG
(248) 377-4950 knightglobal.com
9
10
62
63
66
15
1000
CBL
820
CBL
828
CBL
804
CBL
812
CBL
TAG DETAILS
PROUDLY
MADE IN THE
USA
KNIGHT
GLOBAL
Auburn Hills, MI
KNIGHT
GLOBAL
DANGER
RISK OF ELECTRICAL SHOCK ALLOW 5 MIN. FOR CAP. TO DISCHARGE PRIOR TO SERVICING
WARNING
TO REDUCE THE RISK OF ELECTRICAL SHOCK UNPLUG BEFORE CLEANING & SERVICING
U.S.Patents: (SDS)
7467723 Intuitive Motion
7810791 Active Dampening
10464787 Safety Chain
10900559 Chain Lube
KNIGHT
GLOBAL
MODEL#: KSH1000S-2401-002
SERIAL#: 252525
SUPPLY: 240 VAC, 1 PHASE, 60 HZ
FULL LOAD CURRENT: 12.5AMPS
SCCR: 5KA RMS SYM @ 240VAC
REQ'D OC PROTECTION: 15 AMPS
DATE OF MFG: 12/17/24
END USER: USMC
240 VOLTS

Figure 3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51 14 15 55 13 59 12
29 28 43 42 41 44 45 30 31 33 11 58 32 26 53 56 57
33 31 30 40 32 27 53 56 57
TS1
(2) TERMINALS
L1
L2
TS2
(1) RELAY
(8) TERMINALS
570CR
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4561
7580
TS3
(8) TERMINALS
4560
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4560
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4561
SPARE
4740
VIEW A
SCALE 1:1
VIEW B
SCALE 1:1

Figure 4

	DET	QTY	PART NUMBER	DESCRIPTION	MANUFACTURER
	69	4	M8	LOCK WASHER	COMMERCIAL
	68	4	M8	WASHER	COMMERCIAL
	67	4	M8 x 30mm LG.	SHCS	COMMERCIAL
	66	18	M6	HEX KEPS NUT	COMMERCIAL
	65	2	M6	NYLOK NUT	COMMERCIAL
	64	4	M6	WASHER	COMMERCIAL
	63	4	M6 x 50mm LG.	BHCS	COMMERCIAL
	62	1	M6 x 25mm LG.	BHCS	COMMERCIAL
	61	4	M6 x 20mm LG.	BHCS	COMMERCIAL
	60	2	M6 x 16mm LG.	BHCS	COMMERCIAL
	59	2	M6 x 14mm LG.	BHCS	COMMERCIAL
	58	3	M6 x 12mm LG.	BHCS	COMMERCIAL
	57	10	M4	NYLOK NUT	COMMERCIAL
	56	8	M4 NOM.	FLAT WASHER	COMMERCIAL
	55	8	M4 x 16mm LG.	BHCS	COMMERCIAL
	54	2	M4 x 12mm LG.	BHCS	COMMERCIAL
	53	4	M4 x 10mm LG.	BHCS	COMMERCIAL
	52	20	#12 x 1/2 LG.	PAN HEAD PHILLIPS	COMMERCIAL
	51	4	#4-40 x 3/8 LG.	SHCS	COMMERCIAL
	50	4	94808A153	CLIP-ON NUT, 10-24	MCMASTER-CARR
	49	2	3960T4	SNAP HOOK	MCMASTER-CARR
	48	1	90312A371	LANYARD, 36"	MCMASTER-CARR
	47				
	46				
★	45	1	2966171	SLICE RELAY, 24VDC	PHOENIX
★	44	1	2TLA010070R0400	SAFETY RELAY	ABB
	43	2	240-2079-ND	FERRITE SLEEVE	STEWARD
	42	1	490-8814-ND	CAPACITOR, 0.1uF	LITTELFUSE
★	41	1	WDR-60-24	POWER SUPPLY, 24VDC, 2.5A	MEAN WELL
	40	1	1.5KE47CA	TVS DIODE, 1.5KW	LITTELFUSE
★	39	1	KCA1036-1M.001	MOTOR ENCODER FEEDBACK CABLE, M23, 1M	KNIGHT GLOBAL
★	38	1	KCA1035-1M.001	MOTOR POWER / BRAKE CABLE, M23, 1M	KNIGHT GLOBAL
★	37	1	KSHA1006.001	KOLLMORGEN SERVO MOTOR	KNIGHT GLOBAL
	36	1	2097-R2	SHUNT RESISTOR	ALLEN BRADLEY
	35	1	KCA1034-252525.001	SWISSBIT 16GB MICRO SD CARD	KNIGHT GLOBAL
★	34	1	KCA1037.001	SIEB & MEYER 3.8 KVA SERVO DRIVE	KNIGHT GLOBAL
	33	4	3030174	JUMPER, 3 POLE	PHOENIX
	32	6	0800886	TERMINAL ANCHOR	PHOENIX
	31	2	3030488	END BARRIER	PHOENIX
	30	15	3209549	TERMINAL	PHOENIX
	29	1	3208977	LARGE END BARRIER	PHOENIX
	28	2	3211771	LARGE TERMINAL	PHOENIX
	27	1	0514500000-3.25	MOUNTING RAIL, DIN	WEIDMULLER
	26	1	0514500000-7.25	MOUNTING RAIL, DIN	WEIDMULLER
	25	1	KDSD1060.001	GROUND BAR ~ ALTER	KNIGHT GLOBAL
	24	1	HBL2323	RECEPTACLE, 3P, 20A, 250V	HUBBELL
	23	1	HBL2321	PLUG, 3P, 20A, 250V	HUBBELL
	22	1	221203-6	POWER CABLE, 12/3 OLFLEX TRAY II, BLACK, 6 FT	LAPP
	21	2	SPN-8	CABLE CLAMP, 1/2"	RICHCO
	20	1	BL-75	LOCK NUT, 3/4"	APPLETON
	19	1	STG-75	SEAL RING, 3/4"	APPLETON
	18	1	CG-5075S	CORDGRIP, 3/4"	APPLETON
	17	4	62MP0625	5/8" ID LOCKING RIGID PLASTIC PLUG	MCMASTER-CARR
	16	4	FKFD 4.4-2	4 PIN RECEPTACLE, MICRO	TURCK
	15	1	KCA1016.001	19 PIN WIRE HARNESS	ORRI
	14	1	KDSD1053.001	TAP BACKER PLATE	KNIGHT GLOBAL
	13	1	KDSD1044.001	SINGLE 19 PIN MOUNTING PLATE	KNIGHT GLOBAL
	12	1	KDSD1043.001	RETAINER PLATE	KNIGHT GLOBAL
	11	1	KDSD1010.005	COMPONENT MOUNTING BRACKET	KNIGHT GLOBAL
	10	1	KDSD1046.002	CABLE CLAMP	KNIGHT GLOBAL
	9	1	KDSD1008.002	SAFETY DROP STOP CHAIN GUIDE	KNIGHT GLOBAL
★	8	1	KDSA1004.003	REDUCER ASSEMBLY, 1000 LB, 12' CHAIN	KNIGHT GLOBAL
	7	1	KDSD1037.002	INNER SUPPORT PLATE, LARGE HOIST	KNIGHT GLOBAL
	6	1	KDSD1057.001	ACCESS COVER, LARGE HOIST	KNIGHT GLOBAL
	5	1	KDSD1040.003	BACK PLATE, LARGE HOIST	KNIGHT GLOBAL
	4	2	KDSD1042.001	SIDE COVER, LARGE HOIST	KNIGHT GLOBAL
	3	1	KDSD1038.001	TOP COVER, LARGE HOIST	KNIGHT GLOBAL
	2	1	KDSD1041.001	FRONT PLATE, LARGE HOIST	KNIGHT GLOBAL
	1	1	KDSD1039.002	BOTTOM COVER, LARGE HOIST	KNIGHT GLOBAL

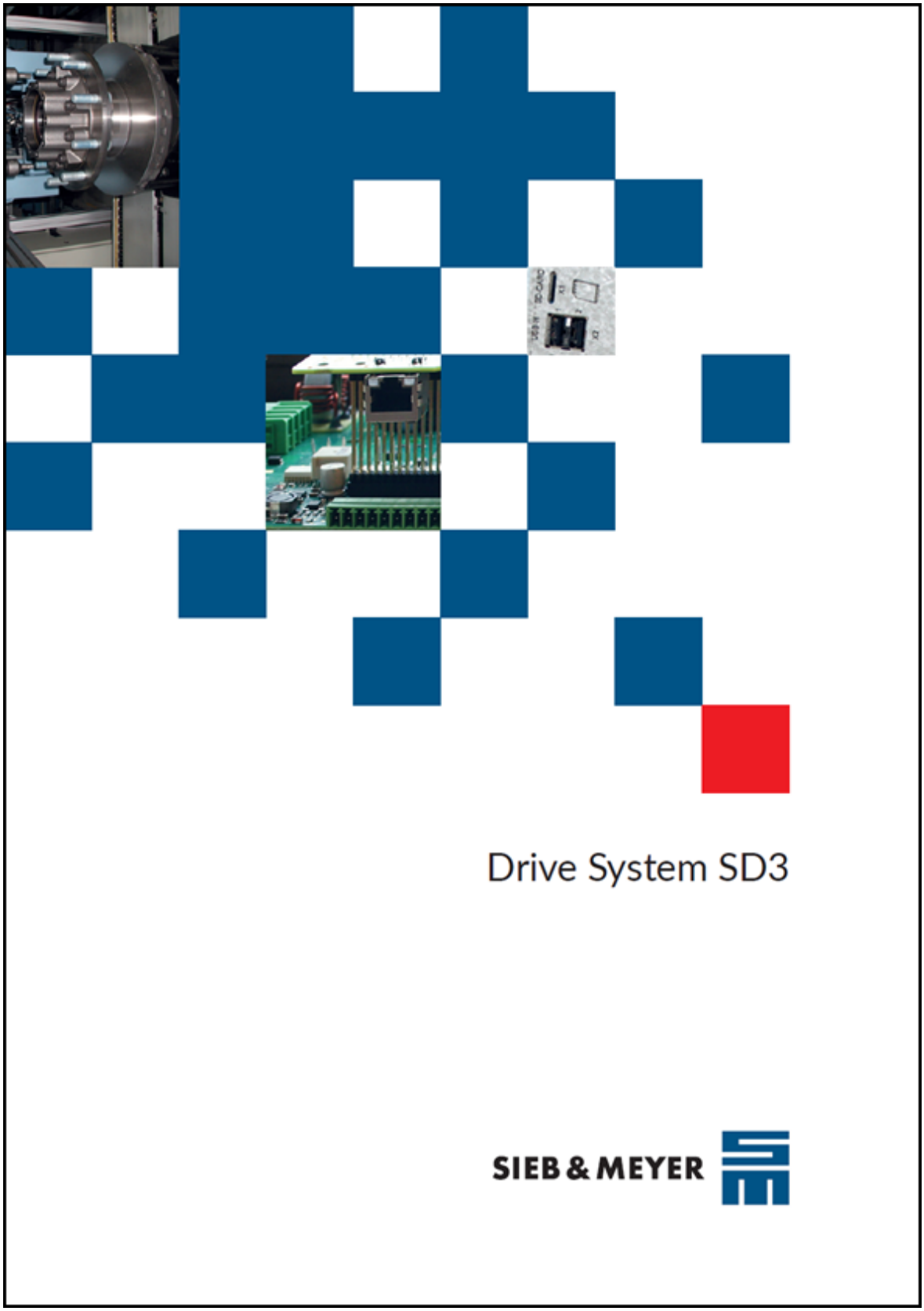
★= RECOMMENDED SPARE PART, A = ACCESSORY

Figure 5

NOTE

Please reference supplied application documentation for job specific part numbers.

14. APPENDIX D: Excerpt from Sieb&Meyer SD3 Drive System



Drive System SD3 with Open System Architecture

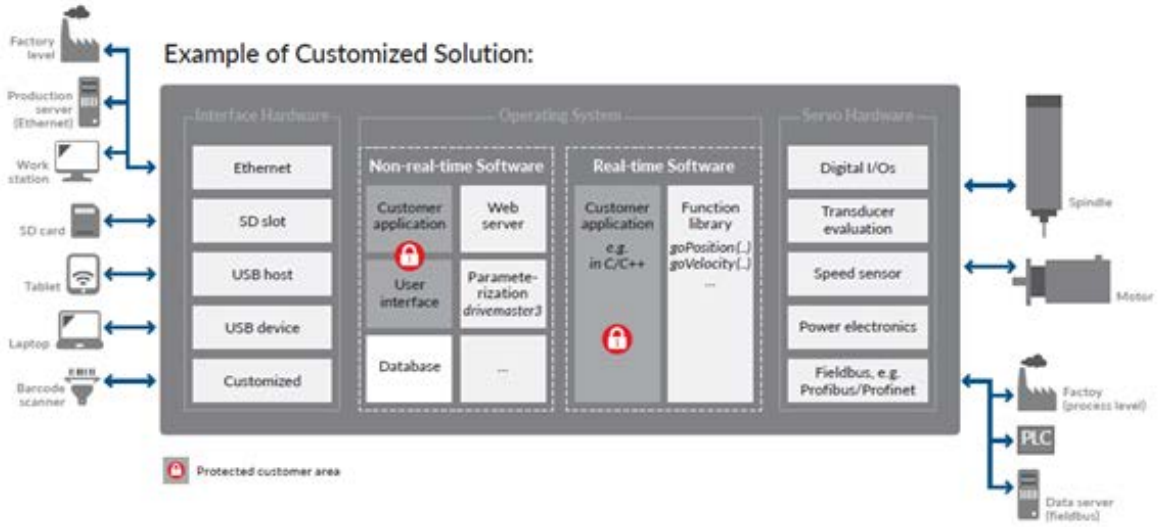
With the drive platform SD3 SIEB & MEYER offers a solution for complex drive tasks, e.g. for high-dynamic positioning applications or fastening and press applications operated by servo motors. Beside an open system architecture for almost all application-oriented control, drive and visualization tasks, the SD3 user benefits from the broad spectrum of additional function modules.

Know-how and Advantage over Competitors

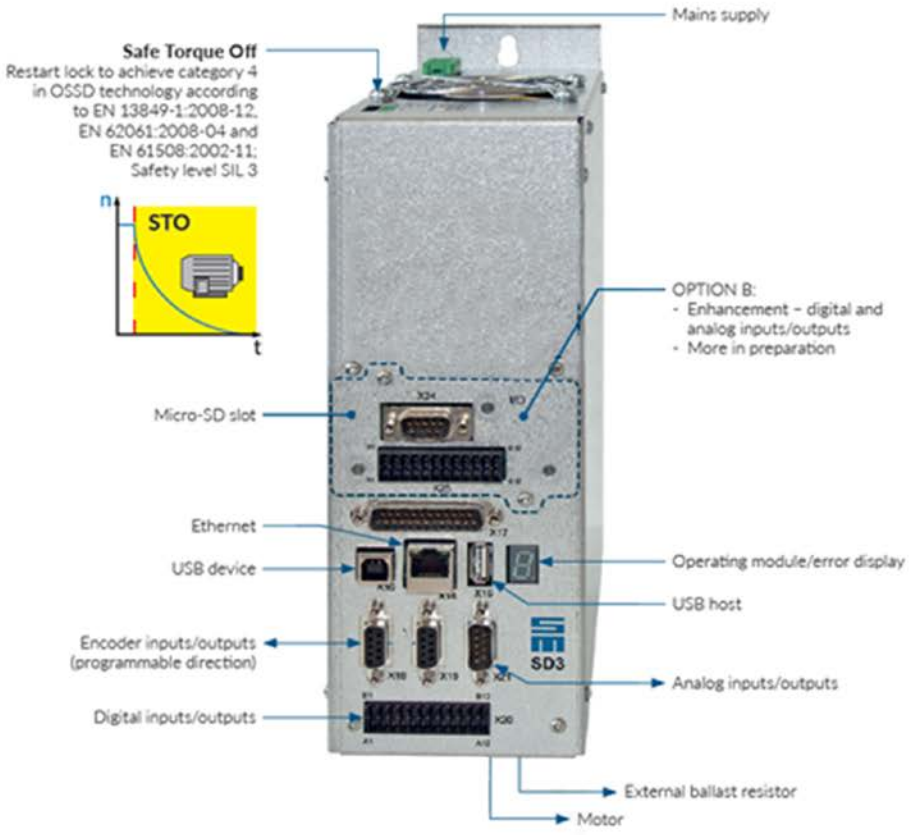
Drive amplifiers are often used to realize machining processes that require most of the know-how for the positioning profile and the evaluation of the process data. The drive platform SD3 by SIEB & MEYER offers the customers an individual solution including a protected application area. By means of the supplied function blocks the customer can focus on his core competence – the application programming relevant for the process.
This way the customer can distinguish himself from the competition. The task sharing during the development process results in a faster "time to market". SD3 is equipped with an open operating system that allows running other functions and programs of the customer at the same time. These are, for example, user interface, statistics, camera integration, communication and data storage. An operator panel can be connected directly via USB. This way an optimal visualization of the processes and a self-explanatory user interface can be created.

IoT Ready

By integrating an OPC-UA server SD3 offers a future-oriented platform that supports topics like Industry 4.0 or IoT.



The Interfaces of SD3



Technical Specifications of SD3

Device type	Rated power [1]	Rated current	Peak current/ time	Max. output voltage [1]	H x W x D	Weight	Cooling
03631490IC [2]	3.8 kVA (6.9 kVA) [2]	20 Arms	56 Arms/0.4 s	3 x 200 VAC	279 x 90 x 236	3.5 kg	Air

Knight Global

Servo System Operation Manual

Knight Global

SDS Servo Hoist Chain Replacement Video

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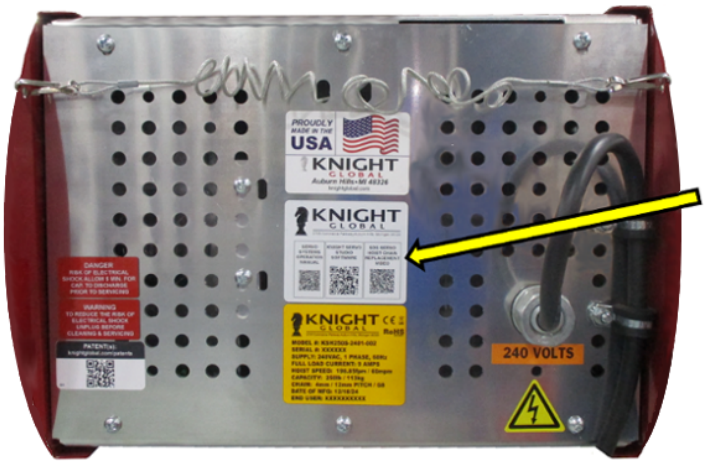
Knight Servo Studio Software Download Site



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